JAMAICA.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR

THE YEAR ENDED 31ST DECEMBER, 1921.

Ordered by His Excellency the Governor to be Printed.

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DEPARTMENT OF AGRICULTURE.

REPORT FOR THE YEAR ENDED 31ST DECEMBER, 1921.

Department of Agriculture, Hope, Kingston P.O.,

23rd May, 1922.

Sir,

I have the honour to submit for the information of His Excellency the Governor, the Report of the Department of Agriculture for the year 1921.

I—GENERAL OBSERVATIONS.

Agriculturally 1921 was a good year for Jamaica, the rainfall for the Island was nearly 84 inches, or 7 inches over the average, while the distribution was good. It is true that the consequences of the great drought of 1920 were still in evidence as regards some of our crops, but on the whole the year was favourable for production, and all sorts of crops gave good returns whereby abundance of food for man and beast was available.

Commercially, however, 1921 was a year of grave difficulty in which all the consequences of the world war were brought to bear on every branch of trade in an acute manner. Jamaica did not escape from these troubles and her trade suffered a severe set-back which seriously affected every producer in the Colony. This position may be summed up in the value of the total Exports from Jamaica in 1920, (a year of poor production) and in 1921 (a year of high production) which stood at £7,146,000 and £3,358,000 respectively,

Progressive planters, both great and small, who had invested capital in agricultural enterprises in 1920 found themselves faced with a severe drop in values and have had to write off large losses in their investments. The Sugar Industry was brought face to face with ruin and but for the prompt manner in which the Legislature came to the aid of our basal industry a severe crisis involving widespread loss and suffering would have taken place. Happily these serious conditions have been successfully surmounted and the island now finds itself in smoother waters and by comparison with other West Indian Colonies in a not unfavourable position for further progress and development. The drought of 1920 was reflected in the Sugar-crop of 1921 so that the Exports fell to 26,000 tons or a reduction of 8,000 tons on those of 1920.

The loss in value, however, was enormous and without precedent in the history of the Colony's Sugar Industry, for the value of our Sugar last year was only a little more than one-sixth of that in 1920 when it stood at £3,000,000.

Jamaica is now favoured with preferential treatment for her sugar both in the United Kingdom and the Dominion of Canada. It is interesting to note that 55 per cent. of our sugar in 1921 went to the Canadian market while 41 per cent. was sold in the English market.

The position of Rum has been indeed a difficult one for the producers in Jamaica. The Export records show that we shipped in 1921, 9,500 puncheons of Rum as against 7,400 puncheons in the previous year, but it is unfortunately true that a good deal of this rum remains still unsold in English and Scottish bonded stores with small prospects of immediate sale. The present English duty of £500 per puncheon of rum has made it most difficult to sell Jamaica rum in the United Kingdom. At the same time with the recent establishment of larger Central Factories in Jamaica the production of rum has been largely increased and mainly by the production of rums of very light body, low in Ethers and not up to the standard of the old fashioned marks resulting from imperfect methods of sugar manufacture and slower types of fermentation.

At the moment the position is far from satisfactory. There is an excess production of not less than 8,000 puncheons per annum beyond the requirements of local consumption and the foreign markets. The Sugar Board is advancing planters £7 per puncheon on this rum while the planters are paying £4 each for 8,000 puncheons to hold rum that cannot be sold at any price at all.

The solution of this serious problem is clearly the conversion of these 8,000 surplus puncheons of rum into Etherised Motor Spirit for use in the Colony. A Co-operative Factory to deal with this 800,000 gallons of rum and to distribute it as Etherised Motor Spirit in Steel drums would cost about £25,000. The planters shoud receive 1/4d. per gallon of 40 o.p. rum from such a factory if the product as motor spirit were sold at 2/ per gallon. If Excise equal to the import duty of 5d. per gallon were charged and the usual trade profits allowed for the public would obtain this motor spirit at 2/9d. per gallon. The effect of this enterprise would be most advantageous to the sale prospects of the better classes of Jamaica Rum, while the interests of the taxpayer and the planters are both affected adversely if rum be overproduced and the market glutted as at present.

The severe blow which the Sugar Industry has so suddenly received in the violent swing of the pendulum from a period of high prices to one below the present cost of production has reacted adversely on the activity of planters as regards improved methods of sugar cultivation, new varieties and the treatment of the Mosaic Disease.

The latter has spread to a considerable extent during the year on some areas. There is strong reason to believe that Maize (corn) is one of the chief means of spreading the disease to sugar canes in Jamaica. Circumstantial evidence is also accumulating that some form of winged insect is the chief agent in spreading the virus of Mosaic Disease to healthy plants.

The North-Indian "Uba" cane which was obtained from Natal in 1916 on the suggestion of Colonel H. E. C. Kitchener (now Earl Kitchener of Khartoum) from his observations of its growth in East Africa during the Campaign in that region, has been found to be a valuable cane for many purposes in Jamaica. Mr. C. M. Calder, Resident Magistrate for Westmoreland, drew the attention of the Government to the possibilities of this cane in 1914 and should also be given credit for his advice in this connection. At Hope a piece of 2 acres of "Uba" cane gave as plants 74 tons cane per acre and 84 tons of cane and tops per acre.

This cane proved to be valuable for feeding to dairy stock and when mixed with a little Cotton Seed meal was readily eaten by the cows.

The Experiment Station has been freed from Mosaic Disease by persistent destruction of infected plants and a good collection of the best canes from Barbados has been established for trial

It is to be regretted that the efforts made by the Plant Breeder to produce seedling canes were unsuccessful, none of the arrows obtained furnishing viable seeds.

It is hoped that more favourable conditions for this work will be obtained next year when the varital canes are in a state of normal growth. The Hope nursery broke the previous record in the distribution of canes by the issue to the public of nearly 200,000 tops of selected varieties in 1921.

The Banana Industry has continued to prosper and although the records show that we only exported ten million stems, or one million more than in 1920, this by no means represents the true state of the Industry which is rapidly recovering its pre-war standard and may be relied on for fifteen million stems of fruit in the current year if all goes well. Panama Disease has extended its incidence during the year and in some areas has shown signs of spontaneous activity apart from direct infection. Two more Inspectors were appointed in December and a further increase of staff to a total of 8 Inspectors has now been authorised.

The utmost efforts of the Government and the planters of all grades are required to control this dangerous disease of the banana. The lack of a Microbiologist during the year was a serious disadvantage. I am glad to record, however, that the recently appointed Microbiologist, Mr. C. G. Hansford of Cambridge University has now taken up his duties and has started some critical researches on this problem which so seriously menaces the future of the Banana Industry.

The Coconut Industry has suffered from glutted markets. The export of nuts was 24 million only as against 28 million nuts in 1920. Copra shows a slight increase in quantity but a reduction in value. The resuscitation of the European markets is a vital factor affecting the success of the Coconut Industry and it is hoped that some improvement may be felt during the coming year.

At the moment coconuts are almost unmerchantable and the planters are suffering from loss of sales.

Logwood, from a position of absolute stagnation has recently made a moderate recovery. Logwood Extract brought in 1921, £109,000, as against £431,000 in 1920. The exports of Logwood were valued at £28,000 as against the fine total of £269,000 in the previous year. With the recovery to normal of the textile and leather industries logwood should again revert to a position of real value and stability as an asset of the Colony.

Orange Oil sold fairly well and brought in about £40,000. The small export trade in Citrus fruits remained steady at the same standard as in 1920.

Cacao showed a welcome recovery in quantity but the prices were poor, and the value of this staple was only £97,000 as against the high record of £212,000 in the previous year.

Coffee greatly increased in quantity, due to a more favourable season, to 3,000 tons as against 2,000 tons in the previous year. Blue Mountain Coffee has continued to sell at high prices in England while the ordinary coffees sufiered from the general drop in values.

Pimento was for a long time quite unsaleable and this staple has been greatly depressed in value.

Over 4,000 tons of Pimento were exported in 1921 of the declared value of £11 per ton. In 1920 3,000 tons of Pimento fetched over three times this price.

The Pimento Oil Industry has been further investigated by the Industrial Chemist who has during the year distilled leaves from male and female trees collected in every month of the year from various pimento growing centres.

The outcome of this investigation is that where pimento leaves and wood fuel are available that the industry of making pimento leaf oil would be a profitable one under present conditions in which such oil is worth 8/ to 10/ per lb. in the world's markets.

A local capitalist has announced his intention of supplying the funds for establishing a factory capable of producing 10,000lbs. of oil per annum on a large property where the conditions for the pimento oil industry are favourable.

The data obtained by the Department as to yields, composition of the oil and sale value abroad which have resulted from these researches are the basis upon which the new industry will be founded.

The Sisal Hemp Industry is now commencing the era of manufacture and export. Three factories in Clarendon and the Government enterprise at Lititz will all be in operation during the coming year so as to produce an appreciable output of fibre.

The market conditions for sisal have recently passed through a serious crisis due to over-production in Mexico and an attempt to corner the market, which failed due to diminishing demands for fibre. At the present moment a more healthy condition of the fibre market has developed and the prospects of prices that will enable sisal to be grown at a profit in Jamaica are considered to be good.

The third trial of the experimental acre of sisal at Lititz was most encouraging. The fibre recovered rose to 5.7 per cent. and a total yield of 1,433 lbs. of fibre per acre was obtained. Within two years this experimental plot has yielded at the rate of 3,390 lbs. per acre from 93 leaves per plant harvested during the trial period. The fibre grown at Lititz is very fine in texture and yet strong with an average breaking strain of 3 lbs. per fibre.

At the time of writing the Factory building has been nearly completed and the machinery is being transported by motor truck from Kingston to Lititz. The water works are still rather behind hand, but it is hoped that a partial supply from the Catchment area will be obtained as soon as the factory is ready to operate. Manufacture is expected to commence at Lititz in August next.

The trade in hides has suffered from the general stagnation of industries and the penkeepers have lost in the sale of their cattle to butchers through the reduced value obtainable for the hides. Goat-skins, however, have kept up very well and an export value of £21,000 for goat-skins was recorded for the year.

Cigars show a decrease of 30 per cent. in quantity and a reduction of £40,000 in value over the exports of the previous year.

The Tobacco industry is suffering seriously from unfavourable conditions and a considerable reduction in the area planted in Tobacco has recently taken place.

The Government Stud Farm at Grove Place was opened to the public in April, and has achieved a remarkable success.

All the Stud animals have been established without loss, and have each worked satisfactorily, and been retained in first class condition.

The records show that 480 cows were sent to the bulls by the public of which 443 were actually served during the year, and that the revenue from Stud Fees was £414 as against the budget estimate of £200. Favourable reports have been received of the progeny of these imported sires, and it is clear that the Farm will soon produce appreciable results in improving stock all over the island.

The most popular Sire was the Brown Swiss bull "Champion Trumpeter" to which 167 cows were put during the year.

This sire is in splendid condition and full of life and vigour after this heavy duty at the Farm.

The co-operative importation of cattle from India was at length completed in March 1922, after a series of most unfortunate circumstances which caused enormous costs for maintenance in India pending shipment of the cattle.

As previously reported 5 bulls out of the sixteen in the first shipment died through bad weather in rounding the Cape of Good Hope. Of the 33 head subsequently shipped from Calcutta we were fortunate

in landing all without loss. Great credit was due to the Captains of the Nourse Line vessels, who gave special care to the cattle, and ensured their safe delivery in Jamaica.

The results of this enterprise are as follows:—

Gugerats	6 Bulls
Hissars	16 Bulls
Montgomerys	2 Bulls
Nellores	12 Bulls
Nellores	6 Heifers
Mysores (Amrit Mahal)	9 Bulls.

Thus a total of 49 Indian cattle have been safely landed in Jamaica and distributed to their purchasers.

The cost of these cattle greatly exceeded the quotations we had received from the Indian Government on account of the unfortunate breakdown in the shipping communications between Calcutta and Jamaica. It is now proposed that the purchasers shall pay 20 per cent. more than the original estimated cost and that General Revenue should reimburse the remaining loss of about £2,500 incurred over the cost of this shipment. This generous infusion of fresh blood from India should during the next ten years play a great part in improving the size and stamina of our working cattle in Jamaica. The Montgomery breed has special merit for milk production and the two bulls are stationed at 'Hope' and 'Grove Place,' respectively.

An "Order" was issued in December making it compulsory for all owners of 100 head of stock to construct a dipping tank before the 1st May, 1922.

This has now been modified so as to allow of an extension of time to the 1st August. There are 74 dipping tanks now registered with the Department, which use the Departmental dip of Paranaph and Arsenite of Soda. This Service saved the planters over £1,000 for the supply of dipping material during the year and it is now clear that as soon as all the new dipping tanks required by the Order are completed that the Laboratory will be saving the public over £5,000 per annum by supplying a cheap and effective dip which replaces the proprietary article at about one-third the cost of the latter.

The experimental plant for the manufacture of Condensed Milk was erected during the year. This is capable of making 25 tins in a batch and will enable a reliable test of the possibility of making Condensed milk in Jamaica to be carried out.

Unfortunately, however, we have been for over two years without a Deputy Island Chemist, and through lack of staff it has been quite impossible to start the work on condensed milk. As soon as a Chemist can be obtained, this work can be put in hand and worked out to a practical conclusion.

The Department has suffered severely during the year from lack of staff. The offices of Deputy Island Chemist, Government Botanist and Assistant Director and Microbiologist were all vacant during the period under review and it must be admitted that the work of the Department has been carried on under very difficult conditions.

II—PUBLIC GARDENS AND NURSERIES, 1921.

Report of the Acting Superintendent of Public Gardens.

1. Hope Gardens.

Rosary.—The work of renewing and lowering the rose beds was continued during the year. Eleven beds of a total length of 180 yards were excavated to a depth of two and a half feet. The bottom soil was disposed of to allow the beds to be lowered as they had become too high for irrigating. Three beds in which the soil had become sour were dug out and renewed with fresh soil brought from other parts of the gardens. Over one thousand rose plants of Mamam Cochet (pink and white varieties) were planted in the beds during the year. Several beds were planted with other varieties in the early part of 1921. These are now well established, adding more colour and interest to the Rose Garden. The collection grown at Hope now includes ten varieties, viz., Mamam Cochet (pink and white), Kaiserin Augusta Victoria, Etoile de France, Laurent Carle, Helen Good, Madame Jules Grolez, Red Radiance, Lady Ursula, Souvenir de Pierre Notting. One thousand one hundred rose plants consisting of fourteen different varieties were imported for sale to the general public. We also imported twenty-four recognised good varieties for trial as to their suitability for the lowlands of Jamaica. These will be given a fair trial before we recommend the varieties to the public. The demand for cut blooms was far in excess of the quantity of blooms obtainable from our present stock of plants.

Bougainvilleas (Rosa Catalina).—We are having great difficulty in propagating this rare variety. Different methods of propagation have been tried; cuttings in various stages of growth have also been tried but up to the present time we have only succeeded in raising four plants from the original plant received in the Gardens.

The "Ruby" Bougainvillea maintains its popularity amongst the general public. There is a continual demand for this variety and every effort is made in the nursery to propagate a sufficient stock to meet the public demands for this attractive plant.

The terra-cotta Bougainvillea (*B. spectabilis* var. *lateritia*) again proved one of the chief attractions in the Gardens. The two seedling Bougainvillea plants mentioned in last year's Annual Report flowered in November. The flowers on each of these plants have shown no improvement on the common Bougainvillea (*B. glabra*) and in consequence are considered of no importance.

Hippeastrums.—The show of blooms in the Hippeastrum beds was very disappointing during the year. Our bed of selected varieties was taken up and the bulbs given a decided rest. By doing this we hope to obtain better results in the coming year. We raised another batch of seedling Hippeastrums from seed obtained from selected flowers pollinated in the Gardens.

Gloxinias.—Three dozen Gloxinia bulbs were imported in the early part of the year. They did remarkably well, their bright colours making an attractive feature in the Plant Houses. Over five hundred Gloxinias were raised from seed. These are making steady progress and should be flowering in the coming year.

Ornamental Borders.—The two long borders were overhauled and cleared of useless growth that had been allowed to over-run the plants. Overhanging boughs were cut back to give more light to the shrubs growing in the borders. Various flowering shrubs were planted to fill up the large gaps created after clearing the shrubberies.

Nursery.—The nursery work received our special attention and every effort was made to maintain sufficient stocks of economic and ornamental plants in demand.

Repairs.—The delapidated seedling house was put in good repair and general repairs carried out on the Plant Houses. Garden benches were repaired and painted, also the "Shelters" at the main and lower entrances to the Gardens.

The long Pergola running from east to west of the Gardens had upright posts and the majority of the crossbeams renewed. These repairs have added much improvement to the general appearance of the Gardens.

Routine Work.—The usual routine work in the Gardens was regularly attended to throughout the year.

PLANTS DISTRIBUTED FROM HOPE GARDENS, 1921.

Sold.

Economic Plants—	
Cocoa	1,738
Citrus	1,031
Nutmeg	494
Eucalyptus	345
Misc. Fruit & Economic Plants	1,850
	5,458
Ornamental Plants	17,645
	23,103

Free Grants.

Economic Plants—	
Cocoa	2,124
Citrus	3,300
Nutmeg	135
Eucalyptus	159
Cane Tops & Cuttings	141,547
Misc. Fruit & Economic Plants	6,120
	153,385
Ornamental Plants	2,562
	155,947
Total number of Economic plants	158,843
Total number of Ornamental plants	20,207
Total number of plants distributed	179,050

The following statement shows the distribution of plants for the last three years from the Nursery at Hope:—

	1921.	1920. April-Dec.	1919-20.
Cocoa	3,862	5,194	8,211
Citrus	4,331	6,318	1,126
Nutmeg	629	458	420
Eucalyptus	504	386	308
Cane Tops & Cuttings	141,547	200	110,089
Misc. Fruit & Economic plants including Timber trees	7,970	6,865	24,632
Ornamental Plants	20,207	11,767	14,920
	179,050	31,188	159,706

Meteorological.—Hope Gardens, 668 feet altitude. The mean temperature is 76.1 F. and the average annual rainfall is 53.85 inches for 41 years. The mean temperature for 1921 is 78.1 F. and the total rainfall was 63.80 inches as follows:—

1921.	Inches.
January ..	4.19
February ..	4.11
March ..	6.96
April ..	3.97
May ..	7.70
June	5.37
July	3.45
August ..	5.11
September ..	10.11
October ..	7.69
November ..	3.45
December ..	1.61
Total ..	63.72

2. Castleton Gardens.

Rosary.—The impoverished state of the soil in the Rose Garden makes it difficult to grow these plants well at Castleton. Decayed leaves and what little manure could be obtained were used for mulching the beds. The centre beds in the Rose Garden are being cleared of their old bushes and the beds replanted with young stock.

Amherstia.—The trees of *Amherstia nobilis* flowered freely. Their gorgeous racemes of flowers being greatly admired by visitors to the Gardens.

Ornamental Borders.—These were forked and weeded when necessary. The shrubs in the borders were pruned regularly and throughout the year the constant display of flowering shrubs gave the Gardens an attractive appearance.

Nursery.—Plants that are difficult to propagate at Hope Gardens are raised in these Gardens and sent to Hope for distribution.

Visitors.—Castleton is one of the chief resorts of picnic parties. The number of people visiting these gardens during the week-end is an indication of how much these gardens are appreciated by the residents of the Island.

Routine Work.—The usual work of billing lawns, weeding pathways, cutting down dead palm leaves, was carried out regularly and the gardens kept in good order.

Heavy rains during the early part of the year did considerable damage to the paths through the Gardens. These have all been repaired.

Plants Distributed from Castleton Gardens.

Sold.	
Economic Plants	1,450
Ornamental Plants	[illegible]
	1,50
Free Grants.	
Cocoa	—
Ornamental Plants	184
Other Economic Plants	56
	240
Transferred to Hope Nursery.	
Economic Plants	588
Ornamental Plants	15,905
	16,493
Total number of Economic Plants	2,094
Total number of Ornamental Plants	16,145
Total number of Plants distributed	18,239

Meteorological.—Castleton Gardens, 496 feet altitude. The mean temperature is 75.4 F. and the average annual rainfall is 118.45 inches for 48 years. The mean temperature for 1921 was 74.1 and the total rainfall was 151.23 inches as follows:—

1921		Inches.
January	..	34.47
February	..	13.26
March	..	8.23
April	..	8.21
May	..	16.88
June	..	6.81
July	..	3.74
August	..	9.47
September	..	8.23
October	..	13.34
November	..	9.46
December	..	19.13
	Total	151.23

3. Public Gardens, Kingston.

Shrubberies and Beds.—The shrubberies were thoroughly overhauled during the past year. Many of the shrubs had become overgrown and needed hard cutting back. This work has been carried out and the ground well forked and manured before re-planting. One thousand ornamental foliage and flowering plants were supplied from the nursery at Hope for making up the borders. I would like to mention how discouraging it is for those in charge of the Public Gardens in Kingston to see the ravages caused by goats which are allowed to roam about the streets of Kingston and during the night find their way into the Gardens and eat the young plants. It seems useless to try and establish young plants in the Gardens while this nuisance is allowed to continue.

Cannas.—Five beds of Cannas were taken up and re-planted in new beds which had been well prepared and good results have been obtained. The striking colours of the flowers of these plants gave the gardens a bright appearance and were greatly admired by the general public.

Water Lilies.—The Lily Tank was emptied in the early part of the year and the stagnant mud cleared out. Fresh mounds were made for the Nymphaeas and other aquatic plants growing in the tank. The continual dust arising from the streets and settling on the leaves spoil the cooling effect of these water plants. We hope in the coming year to fix a central sprayer. This will do away with the unsightly appearance of the plants in the tank at the present time.

Street Trees and Gardens.—General pruning of the shade trees (*Sassia siamea*) in Kingston was done and the trees kept within bounds. During the summer it was found necessary to cut a large number of the trees hard back as they had become infested with the dodder (*Cuscuta* sp.). The trees are now inspected twice every week to prevent any recurrence of this troublesome pest. The palms and lawns in King Street were watered regularly and kept in good order.

Routine Work.—The work of billing lawns, constant watering of borders and beds and general tidying up of the pathways was carried out regularly and the park kept in good order.

Foreman.—Mr. N. Jones who filled the post of Foreman at the Victoria Park, Kingston, was relieved of his duties as foreman on the 13th August, 1921. Mr. J. McDonald who was previously employed in the Department was appointed to succeed Mr. N. Jones as foreman, taking charge of the Gardens on the 13th August, 1921. I am glad to say that a decided improvement in the general appearance of the Gardens has taken place since Mr. McDonald took over his duties.

Meteorological.—Victoria Park, 60 feet altitude. The mean temperature for 31 years is 78.1 F., and the average annual rainfall for 43 years is 30.48 inches. The mean temperature for 1921 was 78.4 F., and the total rainfall was 22.63 inches as follows:—

1921.		Inches.
January	..	0.14
February	..	0.36
March	..	0.48
April	..	1.38
May	..	5.41
June	..	2.81
July	..	0.85
August	..	1.05
September	..	6.20
October	..	3.25
November	..	0.00
December	..	0.70
	Total	22.63

4. Hill Gardens.

Hippeastrums.—Five hundred bulbs of Hippeastrums were sent from Hope to Cinchona for planting in the borders. The seedling bulbs of Hippeastrums sent there a year or so ago have made fine growth and some splendid blooms were to be seen during the year.

Amaryllis Belladonna.—Clumps of *Amaryllis Belladonna* lilies growing on the terraces and amongst the ferns gave the Gardens an attractive appearance during the latter part of the year.

Feijoa Sillowiana.—Plants of this interesting fruit tree were presented to the Department by Mr. W. F. Popenoe, Altadena, California, in 1912, and were planted at different altitudes. The plant at the Hill Gardens has made much more vigorous growth than the other specimens growing at lower elevations. There was a large show of bloom on the tree at Hill Gardens during the summer months. Unfortunately we have been unable to obtain any fruit as they dropped off before maturity. More light has been admitted to the tree by cutting down useless trees growing in the vicinity. By doing this we hope to be successful in getting ripened fruits next season.

Virgin Rubber.—Seventeen trees of Virgin Rubber (*Sapium tolimense*, Jurnelle) were cut down in the nursery to allow more light to get to the young plants growing there.

Beds and Borders.—These were regularly attended to. Young plants were put in to replace old shrubs. Beds of annuals gave the gardens a bright appearance most of the year.

Routine Work.—Mowing and billing of lawns, weeding pathways, and general pruning about the Gardens were atttended to and the grounds kept in good condition for the small sum allowed for the upkeep.

Meteorological.—Hill Gardens, 4,900 feet altitude. The mean temperature is 62.5 F., and the average annual rainfall is 99.90 inches for 51 years.

The mean temperature for 1921 is 63.9 F. and the total rainfall was 112.98 inches as follows:—

1921.	Inches.
January	26.48
February	15.97
March	7.10
April	5.64
May	11.49
June	6.77
July	1.10
August	5.01
September	6.65
October	8.19
November	5.61
December	12.97
Total	112.98

5. King's House Gardens and Grounds.

Rosary.—Special attention was given to the Rose Garden and an abundance of flowers was to be seen throughout the year. The beds were top-dressed several times with chopped manure and then forked into the soil. Several beds overshadowed by large trees growing in the Rose Garden were found unsuitable for growing roses. It was therefore decided to remove the few remaining rose plants and have the beds replanted with *Thunbergia erecta* and Poinsettia (*Euphorbia pulcherrima*). These beds have now improved the general appearance of the Rose Garden.

Borders and Shrubberies.—The borders of mixed ornamental foilage and flowering plants were regularly forked and weeded. These borders contain a large assortment of flowering shrubs that bloom at various times, the result being a continuous display of colours generally to be seen in these Gardens throughout the year.

Lawns.—Several old trees that were an eye-sore about the lawns were cut down and removed. Regular mowing of the lawns kept them in fresh and healthy condition.

Main Drive.—The main drive through the Gardens was re-surfaced and rolled by steam roller. This work was carried out by the Public Works Department.

Improvements.—One large circular bed was opened up near the private entrance to the Gardens. This bed has been planted with a variety of Canna, King Humbert. The handsome bronze foliage and large scarlet coloured flowers of this variety cannot fail to attract visitors on entering the Gardens.

Orchids.—New baskets were supplied for re-basketing the Cattleyas that were in very poor condition. Satisfactory growth has been made since they were attended to and some fine blooms have been obtained.

Pastures.—The pastures surrounding the Gardens were billed and cleared and kept in a fairly tidy condition throughout the year.

Foreman.—Mr. E. Terrelonge, the Foreman in charge of King's House Gardens was transferred to Castleton Gardens on the 30th April, 1921, and was succeeded on the 14th of May, 1921, by Mr. I. Edwards (then a gardener at the Kingston Public Gardens) in the capacity of Headman. I am glad to say that he has given general satisfaction in carrying out his duties.

Routine Work.—The usual routine work was attended to and the Gardens kept in a tidy condition,

6. Bath Garden and Nursery (St. Thomas).

Mr. H. G. Coote, Inspector of Plant Diseases for the eastern end of the Island, who is in charge of this establishment, reports as follows:—

The usual routine of keeping the garden weeded and the paths clean, grass cut, etc., were regularly attended to.

Owing to the heavy rains during the year which damaged certain parts of the garden several of the well established plants were lost and had to be replaced.

The garden is a popular local resort and there were a large number of visitors during the year.

A large number of flowers and ornamental plants were distributed.

Cocoa.—A large number of seedlings were grown but the demand for them has been very irregular and a large portion had to be destroyed.

7. Duckenfield and Potosi Nurseries (St. Thomas).

These Sugar-cane nurseries were started in 1920 under the supervision of Mr. H. G. Coote. The canes made very rapid growth and gave a high yield, but as the scheme for the Central Factory did not materialise there was no demand for cuttings and the nurseries have been abandoned.

8. Montpelier Experiment Station and Nurseries (St. James).

Mr. Stanley Scudamore, Inspector of Plant Diseases for the western section of the Island, reports on the operations for the past year as follows:—

The Nursery has been extended during the year to about 8 acres. At present there are about 60 tons of ripe cane which are being cut and sold to the Factory and the tops distributed. During the year a number of plots of different seedling varieties were planted out, also two experiment plots for the purpose of cross pollination and growing of new varieties of seedling canes for the purpose of obtaining varieties that are of good commercial value and also immune to Mosaic Disease.

During the year the following plants were distributed:—

D.625	8,299
B.208	9,914
J.72	7,760
Uba	25,385
White Transparent ..	4,925
B.6450	775
	57,058

Cocoa.—Owing to the depression in the price of cocoa there has not been a great demand for plants and only 778 have been distributed.

Nursery Sales.—During the year £87 12s. 3d. was realised for Bananas and Canes from the Nursery.

Rainfall:—

1921.	Inches.
January	8.50
February ..	6.37
March	4.42
April	5.46
May	16.57
June	7.97
July	9.00
August	10.50
September	4.60
October	8.00
November	2.90
December	1.40
Total ..	85.69

9. Cascade Nursery (Hanover).

Last year land was obtained at Cascade for starting a Cocoa nursery and during the year a large number of plants were sent out. There was a big demand for cocoa plants from this nursery and 10,000 plants were distributed.

10. Cornwall Nursery (Westmoreland).

Last year land was obtained at Cornwall for starting a Cane Nursery. Three varieties were planted out, viz., B.208, D.625 and J.72, but there has been no demand for tops.

11. Tranquility and Spring Garden Nurseries (Portland).

During 1920 these nurseries were started under the supervision of Mr. J. B. Sutherland who reports as follows:—

Tranquility Nursery.—The following plants were distributed:—

Cocoa	5,000
China Banana ..	500
Braziletto ..	300
Mahogany ..	100
Breadnut ..	50
Total ..	5,950

Owing to the low price for cocoa the settlers ceased planting and over 8,000 plants got over-grown and had to be destroyed. It has been decided to close down the nursery.

Spring Garden Nursery.—The following plants were distributed:—

Cocoa	19,442
Nutmeg ..	5,132
Breadnut ..	446
Spanish Elm ..	220
Braziletto ..	406
Mahoe ..	26
Mahogany ..	571
Total	26,243

12. Albany Nursery (St. Mary).

During 1920 a cocoa nursery was established at Albany and 6,350 cocoa seedlings were distributed but owing to the great fall in the price of cocoa there has been no demand for plants and the nursery has been abandoned.

13. Danks Nursery (Clarendon).

The canes of this nursery have grown well in spite of adverse seasons. The prolonged drought in the Spring of this year has delayed the distribution of tops of which there are a considerable number now available and for which there has been some demand. The J .72, B.208 and D.625 have done extremely well in this district, particularly the D.625.

Eighteen new seedling varities, importations from Barbados, have been planted and some of them give indications of being very useful canes.

Arrangements have been made to plant out on Danks Estate half acre plots with check plots between of the White Transparent of the following varieties: B.208, J.72, D.625 and the old Jamaica Bourbon cane which is well suited to this district. Arrangements have also been made to distribute through the Agricultural Instructor of this district tops to the various branches of the Society under his control.

14. Summary of Plants Distributed by the Department during the last Three Years.

	1921.	April to Dec., 1920.	1919-20.
Cocoa	45,432	10,069	26,610
Citrus	4,331	6,318	1,126
Nutmeg	5,761	458	420
Eucalyptus	504	386	308
Cane Tops & Cuttings	198,605	200	195,654
Misc. Fruit and Economic plants inlcuding Timber Trees	12,683	10,402	25,822
Ornamental Plants	36,352	22,636	16,486
	303,668	50,469	266,426

The Garden and Plantation Sales for the past three years have been as follows:—

1921-22	£516 4 8
1920-21 ..	481 5 4
1919-20	354 15 3

M. S. Goodman,
Actg. Superintendent Public Gardens.

III.—AGRICULTURAL EXPERIMENTS.

Report by Superintendent of Agriculture.

Brown's Town P.O.,
1st February, 1922.

Hon. Director of Agriculture,
Hope, Kingston.

Sir,

I have the honour to submit the report on my work as Superintendent of Agriculture for the year ending the 31st of December, 1921.

This work may briefly be divided under the following heads and sub-heads: Experimental work on the Sugar Estates to determine the value of commercial fertilizers as compared with local manures, varietal tests with canes to determine the value of recently imported seedlings, along with such canes as are grown throughout the Island. The control of the Mosaic disease of canes. The inspection and testing of canes in Sugar Cane Nurseries—Montpelier, Cornwall and Chapelton—Experimental work in the use of Trypan Blue for the treatment of anaemic cattle, Experimental tests on Sisal at Lititz to determine the yield of fibre from an acre and finally the supervision or advice on the erection of cattle-dipping tanks in various parts of the Island.

Canes.—The following series of experimental plots in the use of manures were arranged after consultation with leading planters in various parts of the Island as being most suited to our conditions and based upon the Department's work since 1910.

Plot 1. No Manure.
„ 2. Nitrate of Soda 2 cwt per acre.
„ 3. Sulphate of Ammonia, 2 cwt. per acre.
„ 4. No Manure.
„ 5. Nitrate of Soda, 2 cwt. per acre followed by Sulphate of Ammonia, 2 cwt. per acre 4 months later.
„ 6. Nitrate of Soda, 2 cwt. per acre followed by Nitrate of Soda, 2 cwt. per acre 4 months later.
„ 7. No Manure.
„ 8. Sulphate of Ammonia, 2 cwt. per acre and Sulphate of Potash, 1 cwt. per acre.
„ 9. Nitrate of Soda, 2 cwt. per acre; and Sulphate of Potash 1 cwt. per acre.
„ 10. No Manure.
„ 11. Sulphate of Ammonia, 2 cwt. per acre; and Sulphate of Potash 2 cwt. per acre.
„ 12. Sulphate of Potash, 2 cwt. per acre.
„ 13. No Manure.
„ 14. Cattle pen manure, 30 loads per acre.
„ 15. Lime, 10 cwt. per acre.
„ 16. No Manure.
„ 17. Ashes, 1 quart per root.

It will be noticed that the three kinds of artificial manures, Sulphate of Ammonia, Sulphate of Potash, and Nitrate of Soda, which have been found to give results on the cane lands of Jamaica, have been included in this series of plots, both singly and in conjunction with each other in various proportions, as has also been added the ordinary estate manures, cattle pen, lime and ashes. It will also be noticed that beside each manured plot there is a check plot of No Manure, for purposes of comparison.

The Phosphate manures have been omitted as we have found after years of experimental work, that they give no increased tonnage on our lands.

A series of 15 sets of these plots were arranged on the following Estates in different parts of the Island:

St. Catheine:—Caymanas, Worthy Park, Clarendon, Bog, Amity Hall.
Westmoreland:—Blue Castle, Friendship, St. James, Catherine Hall, Hampden.

Northern Estates.

Trelawny (Upper):—Long Pond, Vale Royal, Georgia.
Trelawny (Lower):—Green Park, Fontabelle.
St. Ann.—Richmond.

I regret that it was not possible to complete these tests in all cases as in some instances the drought was too prolonged and did not warrant the application of the manures—while in other cases the drought after application burnt out the canes on the fields on which the manures were applied. Results however have been obtained from eight centres which I submit in detail on attached forms and may be briefly summarized as follows:

St Catherine—Caymanas Estate.—The only plots giving an increased tonnage from the use of fertilizers were plots where potash was used in conjunction with either Sulphate of Ammonia or Nitrate of Soda—increases of 16, 17, and 14.2 tons per acre were recorded over the unmanured plots of equal size adjoining them—Sulphate of Ammonia or Nitrate of Soda as a single application did not pay expenses. Carbonates in the form of lime or ashes do not appear to be necessary on these soils—attributable I think to the nature of the irrigation water which has a certain amount of lime in it. Cattle manure as a top dressing did not result in any increase of cane.

Worthy Park.—A mixed manure consisting of Sulphate of Ammonia 2 cwt., and Sulphate of Potash 1 cwt. to the acre, gave an increase of 5.6 tons per acre; while lime at the rate of 2 tons per acre gave 7.1 tons increase. Further and more elaborate tests are now under trial to determine the value of these manures singly and in various combinations at different periods of growth.

Westmoreland—Blue Castle Estate.—The value of Nitrogen either in the form of Sulphate of Ammonia or Nitrate of Soda on ratoons on the lighter soils of this estate gave an increase of from 3.6–4.4

tons of cane per acre, which paid expenses and showed a profit. These results are particularly interesting in that they point to a profitable return from the manuring of ratoon canes, which are more or less neglected in this parish in favour of plants.

St. Ann—Richmond:—The results indicate that ashes, giving a return of 4.3 tons per acre is a valuable adjunct to the manures of this estate, while a complete manure consisting of Sulphate of Ammonia 2 cwt. and Sulphate of Potash 1 cwt. gave an increase of 2.5 tons to the acre. A repetition of this experiment on the same plots with the same combinations of manures is being repeated this year.

Vere—Amity Hall.—In this case Nitrogen in the form of Sulphate of Ammonia at the rate of 2 cwt. per acre giving an increase of 4.3 tons per acre indicates its value as a dressing to canes in this parish.

Trelawny—Georgia.—The indications are that a mixed manure of Sulphate of Ammonia and Nitrate of Soda, two to one, pays giving an increase of 5.1 tons to the acre as also does Nitrolim 2 cwt. to the acre with an increase of 5.8 tons. It is noticeable that lime on the red soil of this Estate even at so low a rate as ½ ton per acre resulted in an actual reduction of the yield of cane.

Trelawny—Long Pond, Hyde Hall.—In this instance a mixed manure of 2 cwt. Sulphate of Ammonia and 1 cwt. Sulphate of Potash gave an increased tonnage of 10.9 tons to the acre. Cattle manure is a close second with 9 tons to the acre increase. These results fully support the lines of manuring which have been practised on the estates for years.

St. James—Catherine Hall.—Here again artificial manures proved useful. The combined application giving an increased tonnage of 3.3 tons to the acre over the unmanured plots, the application though barely paying expenses should result in a better field of ratoons than would otherwise have been established had the roots not been strengthened as plants by the application of manure.

It is interesting to note that in every case these experiments have indicated the manure or combination of manures best suited to the individual requirements of each estate and so have proved valuable to the administration of the estates conducting these experiments as they have been enable to eliminate unprofitable manures from their orders and to substitute in their place those which are required in the combinations best suited to local soil conditions.

These experimental plots have been greatly extended this year and we now have under our administration 20 series of plots where we were able to put in but 10 last year.

The following estates are now conducting experiments for the coming year:—

St. Catherine: Worthy Park (3 series of plots);
Bernard Lodge (3 series of plots);
Caymanas.
St. Ann: Richmond.
Trelawny: Georgia, Swanswick, Long Pond, Orange Valley.
Westmoreland:Blue Castle, Sweet River, Friendship.
Vere: Bog, Amity Hall.

Varietal Cane Experiments.—During the year several tests were made of the comparative values of our local canes and those seedlings which have been grown for some time in the Island. I have also established in seven (7) centres experimental plots of the twenty (20) most recently imported canes from Barbados in comparison with the White Transparent and our most promising local seedlings. Arrangements have been made as soon as tops are available to extend these to 12 centres as follows:—

St. Catherine: Worthy Park, Bernard Lodge, Caymanas.
Trelawny: Long Pond, Fontabelle.
St. Ann: Richmond.
Westmoreland: Cornwall.
St. James: Montpelier, Catherine Hall, Hampden.
Clarendon: Amity Hall and Danks.

The following varieties have been planted in these experimental plots:—B.67, B.255, B.295, B.2001, B.S.F.12 (50), B.S.F.12 (27), BA. 11403, B.S.F.12 (48), BA. 7924, BA. 11569, B.268, B.178, B.7169, BA. 12079, B.263, B.261, B.119, D.625, J.72, B.1529.

I submit in detail on attached forms, the results of such Varietal tests as it was possible to take off during the year, among which may be mentioned the following as being most important:

St. James—Bogue.—An experiment was made on this estate in Village Piece comparing the tonnage and sucrose yields of the D.625, J.72, and White Transparent canes. D.625 came out ahead giving 55 tons of cane per acre with a sucrose yield of 5,907 lbs. In another field, No. 21, the White Transparent, though giving only 28 tons of cane to the acre compared with 43 of the D.625, gave the heavier yield of sucrose 5,708 lbs. as compared with 4,850 lbs. of the D.625. This is interesting as it shows that it does not always follow that the heavier cane is the more valuable. I attach to this report full detailed analysis of both tests.

Uba Cane.—This cane is rapidly assuming an important position in the dry area of Vere and on the north coast. The first recorded tests were made at Hampden and Gales Valley Estates in the Queen of Spain's Valley. The Uba Canes yielded at Gales Valley as plants, 31 tons per acre as compared with 22 tons from the estate canes. At Hampden the Uba gave 12 tons to 7 of the Estates' Cane. The yield of juice per ton of cane was the same in both instances, 140 gallons per ton. The low tonnage recorded at Hampden is due entirely to the very severe conditions of drought prevailing during the year. Mr. Kelly-Lawson speaks in the highest terms of the value of the Uba Cane as a help in the solution of the ufel problem.

In Vere, Amity Hall is extending its cultivation to 100 acres. Morelands is also putting in a large field. On the northside, the Northern Estates are planting up Uba extensively. A considerable planting of Uba has taken place at Dundee Estate in Trelawny, in the Bog Walk and Riversdale Districts, also in St. Mary on the lands of the Grays Inn Central.

It is undoubtedly true that as a stand-by in poor years the Uba Cane though not as convenient a cane to reap due to the large number of small canes per stools and the clinging trash, will be a great help toward making up the tonnage in dry districts and under unfavourable conditions.

Sugar Cane Nurseries.

Montpelie , St. James.—Experimental tests were made of the tonnage yields of the different varieties of canes at present growing in this nursery. Full details of these tests with chemical analyses of juices are attached. It is interesting to note that the J.72, as plants, yielding 80.7 tons to the acre gave the highest tonnage recorded, as was also its sucrose yield per acre of 14,457 lbs.

The high tonnage yield of these canes bear ample testimony to the excellence of the Montpelier lands for the growing of canes. The difference between the yield of the different varieties of canes is also noticeable and emphasises the importance of varietal selection as a problem to be carefully studied and tested on the sugar estates of the Island. It is with pleasure that I would further draw attention to the excellent work done by Mr. Stanley Scudamore in this nursery. Without his careful management the results recorded would not have been obtained.

The Nursery at Montpelier has been greatly improved during the past year. Mr. J. W. Edwards has kindly consented to an enlargement of this nursery by giving over to the Department an additional 5 acres of land, ideally situated by the Railway, which is being planted with the most recently imported seedling canes from Barbados.

Chapelton and Cornwall Nurseries.—In these nurseries the canes have grown well and the seasons have been favourable. A limited number of tops have already been distributed which were obtained by jerking out the jointed canes before the stools were nearly ripe for cutting. Arrangements are being made to meet the demands for the April and May planting on the estates which promises to be satisfactory in spite of the slump in the Sugar Industry.

Mosaic Disease.—Planters are much more alive to the necessity of combating the spread of this disease than they were last year. I am unable to report of any one case, with the exception of the Central Station at Hope, where the disease has been completely eradicated. There are many instances, however, where by systematic rogueing the spread of the disease has been checked and in some cases considerably reduced. A system of payment by result has been introduced with great success by some of the planters in Trelawny. A farthing or half-penny per root has been paid for infected stools removed from the fields. While at first the expense where infection is heavy, is high, in the end it is found to be more efficient and in the end much the cheapest method.

The nature of this disease is known generally by all planters and a careful watch is being kept for its appearance, and when found immediately treated. The Uba Cane or more preferably a cross between the Uba and our local canes would be a solution of this problem. There is every reason to hope that such a cane will soon be produced so as to place us in a position to disregard the peril of this disease to our Sugar Industry.

Sisal.—I made the 3rd cutting of leaves from the 1,000 plants at Lititz selected for test purposes and which were cut in 1919 and 1920, making 3 cutting of leaves from these plants. The results are as follows:—

Tests of Fibre Yields at Lititz.

	Nov. 1919.	Nov. 1920.	Nov. 1921
Average No. of leaves fit to be cut per plant ..	32	30	31
Average yield of leaves in lbs. per plant ..	19	18	16.5
Average weight of a single leaf ..	9.6 ozs.	9.7 ozs.	8.8 ozs.
Recovery of fibre (by hand) per cwt. ..	3.4	3.93	5.7
Fibre per 1,000 plants, lbs. ..	646	759	940
Yield per acre of fibre at normal distance of 6x5 ..	938 lbs.	1,029 lbs.	1,433 lbs.

These results are not only remarkable but highly encouraging, the increase of the fibre content of the leaves is due to clean cultivation and favourable seasons. These returns fully justify the enterprise which has proved of such benefit to the people of this district and which holds such possibilities for the future of this drought-stricken area. The development of this industry is receiving considerable attention in Clarendon and has been pushed and encouraged by Mr. Stanley Anderson and his brother. There is now being cut for the new factory at May Pen 600 acres of mature Sisal which area will be increased next year. The Cordage Factory under the management of Mr. Allan Anderson will be making rope early this year. So we see a new industry come into being and Jamaica producing her own rope, keeping money in the country and utilizing lands which have been hitherto unproductive and supplying work to the people of the district. Mr. Anderson is satisfied that Sisal can be produced in Jamaica at about one half the cost of what it can be done for in Mexico.

Dipping Tanks.—There is an ever-increasing demand by the public for Dipping Tanks. The improvement in the condition of a herd after dipping has been started on a property is most marked. Not only are the ticks kept in control and gradually diminished to a vanishing point, but the comfort in handling the cattle is also greatly enhanced. A most marked feature in the recent severe drought was that on those properties provided with tanks their losses of cattle were negligible while the tick infested pens suffered heavily.

Another great advantage resulting from the use of tanks has been the quick and more vigorous growth of young stock. A prominent dairyman has found that the use of the dipping has not only freed his property of ticks but has eliminated scours and other calf troubles and his losses since the erection of the tank has been negligible.

Trypan Blue.—I was requested by Mr. Bovell at Caymanas Estate to blue 20 head of anæmic and drafter steers to determine if this would result in their more quickly fattening for the butcher. The injection having been recently done I am unable to report at this time fully on the matter but so far the results have been most satisfactory. Last year I used trypan blue effectively on poor stock in drought districts There is no doubt but that it has proved useful in helping penkeepers to keep alive poor and anæmic cattle, by the destruction of the tick fever parasite in the blood and so giving the cattle a fighting chance over adverse conditions.

I have the honour to be,

Sir,

Your obedient Servant,

P. W. Murray,

Supt. of Agriculture.

Report by Plant Breeder.

Sir,

I have the honour to submit my report on the Experiment Station for the year ending December 31st, 1921.

Canes—The demand for tops, principally of the Uba cane which is immune from the mosaic disease, has been very great this year Out of a total of 141,547 cane plants distributed during the year 130,550 were of the Uba variety, this being the largest number of Uba cane plants distributed from the Experiment Station. I may mention that a two-year old field of this cane gave a yield of 74.25 tons of cane and 10 tons of tops making a total of 84.25 tons per acre.

Several fields of old ratoons have been ploughed and planted in all the most promising varieties and a large area in the Uba cane to meet the continual dema d for plants of this variety.

Twenty new varieties of seedling canes were received from Barbados during the early part of the year, viz.:

B. 67	B. 6450
B. 119	B. 6875
B. 178	B. 7160
B. 255	Ba. 7924
B. 260	Ba. 8409
B. 261	Ba. 11569
B. 263	Ba. 12079
B. 268	B.S.F. 12 (27)
B. 295	B.S.F. 12 (48)
B 2001	B.S.F. 12 (50)

The B.6835 has been lost owing to its susceptibility to mosiac disease. Most of these new seedlings have been sent out to sugar estates for field experimental purposes.

For several months no mosaic diseased canes have been found in the Experimental Station at Hope and I may say with a certain amount of confidence that the Station is free from the disease.

The canes flowered so irregularly that no hybridising could be done.

Pines.—The pines that were planted out during 1920 and 1921 are doing well and it is hoped to establish another acre during 1922.

Guavas.—One square chain has been planted out next to the old Guava plot with seedlings obtained from a very large guava procured from St. Catherine.

Mangoes.—There are now 119 budded Bombay mangoes growing along the Station borders, 40 in the plot to the east of the tobacco house and 32 in the Mango Grove proper. Some of the trees in the Grove were taken out as they were too close. Besides the Bombay we have the following varieties, some of which have not yet borne fruit:—Arbuthnot, Julie, Cambodiana, Mulgoba, Sandersha, Golban, Gordon, Strawberry, Singapur, Fernandez, Langra, Bernarsi, Fuzli, Amini, Malda, Pahutan and Rajpury

Cotton.—The plot of Cauto Cotton planted last year has done well giving a yield of approximately 3,000 lbs. of seed cotton per acre. It is proposed to ratoon it this year; half of the plot will be ut back and the other half will remain as it is. This is to ascertain if it is advisable to cut back ratoon cotton.

Cocoa.—Work was continued in the cocoa-plot during the year. Many of the trees were pruned and in a few cases gormandizers were allowed to ake the place of diseased trees. The young trees set out during last year have nearly all taken and have recently been forked and mulched. Those that have died have had the spots supplied and an extra amount of shade has been added. Some of the older trees bore exceedingly well and the students of the Farm School have had practice in the fermenting of the beans. The trees are now in full bearing. The flood system of irrigating the plot has been discontinued and it is ow being watered by means of shallow drains leading from a head trench. The general appearance of this plot is much improved.

The old cocoa plot suffered severely from the drought last year and as no water could be obtained for irrigation a number of the trees died. The few remaining trees in the plot have since been dug out and the plot planted in c nes.

Coffee.—During the year the usual pruning was done. The empty spaces were supplied with seedlings and these have all taken. The entire plot was cultivated and mulched during the latter part of the year. The bananas planted last year as shade trees are doing very well indeed. The crop from both "long-top" and "short top" was good but it can be easily seen that the former does better in the lowlands here. It is worthy of note that although the trees were severely affected by the drought of the past two years they, on the whole, show a very healthy appearan e.

Cassava.—The cassava plot established last year from the best Trinidad and Jamaica varieties did well. Those of the bitter varieties which were allowed to remain over for a longer period hav produced very large tubers. Five of the Trinidad varieties have again been set out and these will be reaped during the coming year. A few of these have been distributed to applicants.

Citrus—Some of the imported varieties are doing well in spite of adverse conditions. Several of the trees have been recently pruned and spraying for the Black Fly pest has been continued. Preparations are now being made for the supply of the empty spaces with a view to establishing a small grove.

School Garden.—The old site for the School Garden has been abandoned as being undesirable owing to the shade from the mango and citrus trees. An adjoining plot of ¼ acre has been obtained and a well laid out garden has been established by the Students. All the plots are in a flourishing condition due chiefly to the system of irrigation. The following are cultivated:—Banana, Plantain, Canes, Pines, Cassava (bitter and sweet), Garden Eggs, Tomatoes, Turnips and Peas.

Agricultural Education.—The Students of the Farm School received instruction five days per week in the crops mentioned above. They have performed throughout the year the various operations necessary in farming, including the preparation and application of fungicides and insecticides, viz., forking, ploughing, harrowing, manuring, mulching, irrigating, draining, budding and pruning.

I find that the Students as a whole are very keen on this branch of their work and as a result very good work is done.

W. S. Goodman,
Plant Breeder.

IV.—SISAL PLANTATION AND FACTORY, LITITZ.

1. The Crown lands on the Lititz Savannah, containing about 1,100 acres in all, have been utilised for the sisal plantation. The establishment of this cultivation was commenced in 1917 when a vote was provided for this purpose on the Estimates. The total expenditure from General Revenue to the end of March, 1922, in establishing the plantation has been as follows:—

Cost of Establishing Sisal Plantation.

1917–1918	..	£150 1 3
1918–1919	..	774 7 9
1919–1920	..	1,369 11 0
1920–1921	..	2,055 5 10
1921–1922	..	1,837 7 0
		£6,186 12 10

2. The factory has been placed at the northern extremity of the plantation so that the lands immediately adjacent thereto, which are in private possession may be established in sisal by the public and the leaves sold to the factory on a co-operative basis. The factory is prepared to pay 2 per cent. on the price of sisal fibre f.o.b. Kingston, for leaves delivered at the factory. That is, if sisal be worth £30 per ton, the price of leaves delivered at the factory would be 12/ per ton. A bonus, representing half profits, will be paid in addition at the end of crop for leaves purchased by the factory.

There are about 1,000 acres of land within 2 miles of the factory suitable for sisal of which 200 acres have already been planted by one land-owner.

The Lititz Board is willing to advance £2 per acre under the Agricultural Loans Law, *Law 6 of* 1887, for approved plantation of sisal to be established within 3 miles of the factory.

3. *Capital Works*—Under the Loan Law, (Law 22 of 1921), authority has been given for raising a loan of £27,000 for the establishment of the Fibre Factory at Lititz.

A schedule is attached showing the original estimate on which the Loan was based and the actual expenditure to 16.3.22. This shows that £16,157 has been spent and that the balance of £10,843 remains unexpended.

It is estimated that with strict economy a saving of £2,000 will be effected on the original estimates and that the final expenditure from loan will not exceed £25,000.

4. *Operation of Factory*—It is proposed, subject to approval of the Secretary of State and the Legislative Council, that from the 1st April, 1922, the Lititz Factory shall operate on a "Working Acount" at the Treasury, as is done in the case of other enterprises of an industrial nature, operated by the Government.

It is estimated that a crop of 200 tons of fibre should be harvested in 1922-1923, while in 1924-5 the plantation should fully meet the capacity of the factory with a yearly output of 500 tons of fibre.

The market for sisal has recently passed through a crisis but there is now reason to expect a stabilization of the trade, due to the drastic action of the Mexican Government in restricting output and imposing an export tax on sisal from Yucatan.

The working estimate for 1922-23 is as follows:—

Expenditure:—			
	Personal Emoluments ..	£1,000	
	Cultivation	1,000	
	Manufacture and transport 200 tons fibre at £15	3,000	
	Total	£5,000	
Revenue:—			
	200 tons fibre at £30 ..	£6,000	
	Surplus for 1922-23		£1,000
	ESTIMATE 1924-1925.		
Expenditure—			
	Personal Emoluments ..	£1,000	
	Cultivation	1,000	
	Manufacture and transport 500 tons fibre at £15	7,500	
	Total	9,500	
Revenue—			
	500 tons fibre at £30 ..	£15,000	
	Surplus in 1924-25 ..		£5,500

H. H. COUSINS,
Director of Agriculture.
27.3.22.

CAPITAL EXPENDITURE LITITZ SISAL FACTORY.

Particulars.	Original Estimate.	Actual Expenditure to 16.3.22.
	£	£
Machinery, Robey & Co. ..	6,117	6,621
Water Supply—		
Reservoirs	6,270	767
3″ Pipes	1,785	1,091
Wire Fencing for drying fibre ..	380	—
Factory Building	2,247	1,580
Workmen's Buildings P.W.D. ..	1,733	2,096
do. D/Ag. ..	600	124
Tramways	3,130	1,479
Locomotives	1,100	616
Wagons, Robey & Co.	900	411
Freight and Charges	268	..
Furniture	810	31
Manager's House	1,500	141
Surveys and Miscellaneous ..	160	250
Supervision	..	20
Motor Service	..	930
Totals ..	27,000	16,157
Net Balance available	£10,843	

LITITZ FIBRE PLANTATION.

Expenditure 1921-22.

Weeding and Cleaning ..	£ 749	4	1½
Planting	546	4	0¼
Nurseries	116	18	9
Transportation	61	15	6
Supervision	118	13	4
Buildings, Repairs & Miscellaneous	330	11	1¼
	1,923	6	10

Total area planted 1921-22 354¼ acres.

Rainfall 1921.

1921.	Inches.
January ..	.75
February ..	3.57
March ..	3.33
April ..	3.10
May	16.17
June ..	3.94
July	2.67
August ..	3.02
September ..	7.44
October ..	3.84
November ..	2.99
December ..	.73
	51.55

V.—AGRICULTURAL EDUCATION.

Report by Headmaster, Farm School.

The Director,

I have the honour to forward my annual report for the year 1921.

Numbers.—The following have been the numbers present per term during the year:

Easter	38
Midsummer	35
Christmas	43

These figures show that the demand for reservations for students still continues and that we are able to keep the School filled to its maximum capacity.

Students.—The following students completed their three years course and were awarded certificates —

O. B. Lawrence	S. A. Fearon
G. C. Linton	R. W. Newman
A. S. Sandford	W. E. Constable
J. L. Anderson	H. N. Surgeon.

Staff—Mr. H. R. Angell resigned in April in order to proceed to the Ontario Agricultural College and was succeeded by Mr. L. A. Powell.

Miss Carrington resigned her position as Matron on proceeding abroad and was succeeded by Miss Davis.

Curriculum—The usual course of instruction was carried out.

General—I regret that there was a serious outbreak of Typhoid fever during the Christmas Term.

REPORT BY MEDICAL OFFICER.

Halfway Tree,
January 24, 1922.

Sir,

I have the honour to submit the following report on the health of the students and the sanitary conditions of the Hope Farm School during the year 1921.

The general health has been fair.

Several students have suffered from Influenza and a few from Measles.

Four cases of Enteric fever occurred shortly after the re-opening of the December term.

All the students were subsequently injected with antityphoid vaccine.

I made 43 visits to the Institution during the year.

I have recommended the installation of water closets and absorption pits in place of the present bucket system which is potentially dangerous.

I am
Sir,
Your obedient Servant,
LEWIS A. CROOKS.

The Honble.
Director of Agriculture,
Hope Gardens.

REPORT BY VETERINARY CONSULTANT.

"Merton," Halfway Tree,
January 20th, 1921.

The Hon. Director of Agriculture,
Hope.

I have the honour to submit my report for the year ending 31st December, 1921.

As Veterinary Consultant, my work consisted in lecturing on Veterinary Science to the students at the Farm School, and in giving advice or treating sick animals when requested by you.

The lectures to the various classes of students included the principles of the following subjects respectively:—

1st Year: (a) General anatomy and structure of the horse with references to the other domestic farm animals.
(b) Stable management and routine with methods of securing and restraining animals—the various points of the horse—grooming, etc.

2nd Year: Physiology, including circulation, respiration, digestion, etc.
(b) Hygiene, including water supply, stable and cowshed construction, air and ventilation.

3rd Year: (a) Pathology, simple diseases.
(b) The care and treatment of animals in health and disease, foods and feeding, etc Treatment and care of mares in foal and foals; mares after foaling; cows in calf, calves and cows after calving.
(c) Ageing animals.
(c) Medicine, the simpler diseases and simple every-day remedies.
(d) Surgery, Castrations, lameness, etc.
(e) Shoeing, preparation of the foot, its structure, various shoes and their fitting. Diseases due to shoeing and their remedies.

Practical demonstrations were also given. I found the students, without exception, taking a lively interest in their veterinary studies.

Sick animals suffering from various complaints were treated and my advice, when sought, was given both to the Department and to correspondents.

Advice to the latter was sometimes difficult, if at all possible, owing to the meagre description of the complaints of animals that were often furnished.

I have the honour to be,

Sir,

Your obedient servant,

G. O. RUSHIE-GREY,
Govt. Vety. Consultant.

VI —INSPECTION OF PLANT DISEASES.

The year's work has been marked by a pronounced increase in the activity of the spread of Panama Disease.

A total incidence of 2,261 diseased plants was recorded for the financial year 1921-1922 as against 761 in the previous year.

Strenuous efforts have been made to deal with this serious disease and as the Staff of Inspectors was not adequate to deal with the situation the number of Plant Diseases Inspectors has been increased from 4 to 8 officers in 1922.

"Orders" were issued for burning banana trash at all buying stations in the parishes of Portland, St. Mary, St. Ann, Hanover, St. Andrew and St Catherine, also for prohibiting the removal of banana suckers from the parishes of Portland and St. Ann.

"Bud Rot" of Coconuts was rarely observed during 1921 and our chief activities have been connected with the treatment of cases of Panama Disease of Bananas.

PANAMA DISEASE REPORT FOR THE YEAR 1921-22.

Month.	Total No. of Diseased Plants.	New Cases.	Recurrences.	Total Cases.
April—1921 ..	192	2	41	43
May	110	6	27	33
June ..	64	3	31	34
July ..	37	9	6	15
August ..	47	2	20	22
September ..	74	4	9	13
October ..	94	3	26	29
November	122	3	34	37
December ..	198	12	27	39
January—1922 ...	330	11	80	91
February ..	503	9	102	111
March	560	24	117	141
Total for the year ..	2,261	88	520	608

Record of Diseased Plants for the Whole Island for Eleven Years.

1911–1912 ..	685	First discovery
1912–1913 ..	20	No inspection
1913–1914 ..	156	Inspection started
1914–1915 ..	168	
1915-1916 ..	236	
1916–1917 ..	163	
1917–1918 ..	125	
1918-1919 ..	273	
1919-1920 ..	255	
1920–1921 ..	761	
1921-1922 ..	2,261	

VII —LIVE STOCK.

GOVERNMENT STUD FARM, GROVE PLACE.

As this is a new institution it will be well for some detailed explanation to be made as to its objects, scope and financial basis.

The Stud Farm is a public facility for enabling cattle breeders to obtain the services of superior bulls for the improvement of the cattle in the Island.

Cows are received for service to any bull at the Stud, at the owner's selection, for a fee of ten shillings per cow, including one month's free pasturage.

In order to compensate breeders at a distance from Manchester, an arrangement has been made whereby for a fee of one Pound, a cow can be received at any Railway Station for transport to 'Grove Place' and return, the fee to provide for service of a selected Sire and one month's free pasturage. When it is necessary to keep cows at Grove Place, for more than one month, pasturage is chargeable to the owner and is credited to the Working Account of the Farm.

The management and provision for the maintenance of the Stud animals and of the transport of visiting cows by rail are provided for on the Estimates of the Department

The fees (which also provide for one month's free pasturage for each cow) are credited to General Revenue under the heading "Stud Fees, Grove Place."

For the financial year 1921-1922, representing the first year's operations of the Stud Farm the Expenditure and Revenue have been as follows:—

Expenditure.

Personal Emoluments—			
Superintendent	..	..	£300 0 0
Stock Manager	..	..	208 0 0
Labour	..	..	177 17 11
Food for Stock	..	..	197 1 11
Railway Transport		..	279 8 6
Contingencies	..	..	39 6 5
			1,201 14 9

Revenue.

Stud Fees, Grove Place		..	413 15 9

These figures show that the net cost of operating the Stud Farm for the year was £788. The number of cows received from the public for service by the bulls was 443. It is thus apparent that the cost of service for a cow at the Stud Farm is 54/, whereas the average fee paid by the public was 18/.

If the full cost of such services were charged it is obvious that the smaller cattle owners, who have been prominent supporters of the Stud Farm, would be prohibited from taking advantage of the facilities offered.

On the other hand, it is manifest that the general distribution of the valuable blood which is available at the Stud Farm will in a few years exercise a marked effect on the quality of cattle owned by all classes of the community in the near future.

As a reproductive enterprise for promoting the wealth of the Colony by improving the quality of its cattle for purposes of beef, milk and draught the Stud Farm can be confidently recommended as a sound investment and a profitable enterprise for the community. The first year's experience at 'Grove Place' has proved that there was a genuine public demand for the Stud Farm and our facilities were in fact, greatly strained in order to meet the response of cattle breeders to the advantages offered to them.

I desire to record my special thanks to the Director of the Railway for his valuable co-operation in establishing a siding and cattle-dock at 'Grove Place' and for connecting the farm with the Railway Telephone Service. Owners of cattle can now rely that their cows, once on the train, will be safely landed on the farm without the risks attendant to a journey by road from the Railway Station at Kendal to 'Grove Place.'

Convenient arrangements for ordering cars enabling the public to send cows to 'Grove Place' from any Railway Station have also been made by the Railway management.

It is satisfactory to record that despite the great risk of loss to imported bulls from Northern Countries not a single sire has been lost. All the bulls are in first rate order and condition and the crop of calves now coming in from their services are giving satisfaction to their owners.

The Under Secretary of State for the Colonies, Major the Honourable Edward Wood, M.P., paid a visit to the Stud Farm at 'Grove Place' on December 17th.

The Bulls available for the public at "Grove Place" during the year 1921 were as follows:—

Beef Breeds.

1. "Hereford Bull, "Peacemaker" 35,397 by Shraeden Wizard 28,718, out of Phyllis v. 44, p. 896. Prize Winner Royal Agricultural Society of England, Born Jan. 1917, Imported August 1920. Landed weight, 2,142 lbs. Weight December, 1921, 2,023 lbs. Breeder, John Walker, Worcester, England.
2. Aberdeen-Angus Bull, "Popinjay of Buckland," 46,623 by Proud George 38,595 out of "Elsma" 46,600. Born April, 1919. Imported October 1920. Landed weight 1,230 lbs. Weight December 1921, 1,484 lbs. Breeder: Capt. C. T. Scott, Buckland Manor, Worcester, England.
3. Sussex Bull, "The Arab" 4,365 by "Lock Arab" 2,819 out of Apsley Glitter, 11,265. Born August, 1916. Landed Weight 1,706 lbs. Weight December 1921, 2,016 lbs. Breeder Major G. H. Loder Crawley, Sussex, England.
4. North Devon Bull, "Northmoor Rentpayer," 9,873 by "Gotten Prince 2nd" 8,070, out of Northmoor Rachael, 28.840. Born March 1917. Imported August 1920. Landed weight, 1,448 lbs. Weight December, 1921, 1,692 lbs. Breeder: Sir G. A. H. Wills, Somerset, England.

Milk and Beef Breeds.

5. Brown Swiss Bull, 'Trumpeter II of Hintonway" 4,606 by Junker II 3,788, out of Fifine of Hintonway, 4,267. First prize & Champion Eastern Stakes Exposition and Dairy Show, 1917. Born March, 1914. Imported April, 1920. Landed weight 1,646 lbs. Weight Dec. 1921, 1,764 lbs. Breeder: Myles Hemenway, Windsor, Vt., U.S A. Purchased from F. Freemyer, Walhalla Farms. New York.
6. Red Poll Bull, "Panama Junior" 32,378 by Teddy's Panama 28,212 out of 40,629 Jean Du Luth Purity A. R. 1st Prize Tri-State Fair. Born July, 1917. Imported February 1919. Landed weight, 890 lbs. Weight December, 1921, 1,750 lbs. Breeder: Jean Luth Farms, U.S.A. Dam gave 12,000 lbs. milk, and 500 lbs. fat.
7. Red Poll Bull, "Pilot of Hope" J 76. Born May, 1920, by Pilot Lee 29,395 out of Jean Du Luth Purity 40,629. Bred by Jean Du Luth Farms, U.S.A. Weight December, 1921, 700 lbs. Dam gave 12,000 lbs milk, and 500 lbs fat.

Dairy Breeds.

8. Jersey Bull, "Sophie's Jacoba Hector" 132,615 A.J. C.C. by Sophie's Preimer 11,613 A.J.C.C. out of Jacoba's Hector's Loretta King's Idelpha 268,900 A.J.C.C. (Class A.A. R.M.). Born March, 1914. Imported September, 1917. Landed weight 1,154 lbs. Weight Dec. 1921, 1,456 lbs. Breeder: F. B Keeney, Warsaw, New York, U.S.A.

9. Ayrshire Bull, "Auchenbrain Cyril" 17,535 by Auchenbrain Sunlight 15,832 out of Auchenbrain Craig 21st 34,662. Born March, 1918. Imported August 1920.. Landed weight 1,210 lbs. Weight December, 1921, 1,498 lbs. Breeder: David Wallace, Auchenbrain, Scotland.

10. Zebu Jersey Bull, "Experiment" a proved sire of great diary cows for the tropics. Weight 1921, 1820 lbs. Born June 1911.

11. Zebu Jersey Bull, "Honourable Mr. Polo" by Jersey Bull, "Mr. Polo of Bleak House 26th" out of Zebu Jersey Cow, "Honey." Weight 1921 (Dec.), 1,120 lbs. Born February, 1919.

12. Native Guernsey Bull, "Coley's May King" J. 1 by May Rose Searchlight 33,074 out of Colza of Jean Du Luth A.R. Weight December 1921, 740 lbs. Breeder: Jean Du Luth Farms, U.S.A. Born July, 1919.

13. Montgomery Bull, "Dairyman of Pusa." Imported from India November, 1920. Weight December, 1920, 470 lbs. Weight December 1921, 770 lbs.

Draught Cattle.

In addition the following selected Zebu Bulls from India were imported during the year and were kept at Hope for acclimisation. These sires will shortly be ready to take their places at the Stud at 'Grove Place" and will complete an array of 14 stud bulls in which the Colony can justly take pride as unequalled in the live-stock records of the Tropics.

Zebu Bulls.

14. Super-Hissar "Viceroy of Hissar". No. 257. Imported December, 1921. Weight 792 lbs.

15. Hissar Bull, "Pride of the Punjab." No. 140. Imported November 1920. Weight June, 1921, 692 lbs. Weight December 1921, 982 lbs.

16. Nellore Bull, "Majestic." Imported September, 1921. Weight December, 1921, 934 lbs.

SERVICES BY BULLS AT GROVE PLACE.

1921-1922.

	Visiting Cows	Farm Cows.	Total.
1. Hereford Bull, "Peacemaker" ..	51	..	51
2. Aberdeen-Angus "Popinjay" ..	20	..	20
3. Sussex Bull "The Arab"	57	1	58
4. North Devon "Rentpayer" ..	39	2	41
5. Brown Swiss "Trumpeter" ..	133	34	167
6. Red Poll Bull "Panama" ..	44	25	69
7. Red Poll Bull "Pilot"	1	5	6
8. Jersey Bull "Hector"	35	8	43
9. Ayrshire Bull, "Cyril"	..	7	7
10. Zebu-Jersey Bull "Experiment" ..	23	5	28
11. Zebu-Jersey Bull "Hon. Mr. Polor ..	22	9	31
12. Guernsey Bull "May King" ..	14	9	23
13. Montgomery Bull, "Dairyman of Pusa"	4	1	5
Total	443	106	549

Grove Place Pen—In order to obtain a site for operating the Stud Farm it was decided by the Legislative Council in 1920 that a property should be purchased rather than that a portion of "Montpelier" in St. James, as was first proposed, should be leased for the purpose of establishing this enterprise. "Grove Place" in Manchester was therefore selected as the most convenient central and suitable property which was obtainable for this purpose. This property consisting of 3,362 acres and containing 61 pastures of which 633 acres are scheduled as "Guinea Grass" and 520 as "Commons," or a total of 1,153 acres in pasture, was purchased from Dr. E. V. Halliday for £10,000 in July, 1920.

It was decided to operate this enterprise as a part of the Public Loan of 1921 for establishing various Public Works and a total sum of £25,000 has been authorized for the purchase and equipment of "Grove Place" and the establishment of the Stud Farm thereon.

The actual expenditure on Loan Account to date has been as follows:—

Grove Place Capital Account Expenditure to 31.3.22.		£
Purchasing of property including transfer		10,106
Purchase of Live Stock,		
Cattle	£3,935	
Horsekind	1,430	5,365
Dead Stock.		
Oil engine, silage machinery, carts, waggons, Harness, Cattle scale, Clipping machines, etc.		1,040
Railway Charges		80
Capital Improvements.		
Barbecues, tanks, cow stables, Bull Stalls and paddocks, Stock Manager's House, Office, Workmen's Quarters—Dipping tank (£130) General repairs to property		5,318
Miscellaneous		128
Total Expenditure		22,037
Balance required to complete Capital Works		2,963
Grand Total		25,000

The 'Grove Place' Pen is being operated on a "Working Account" at the Treasury as is done with other industrial Enterprises of the Government.

It is anticipated that when the herd has been brought into a productive state that a substantial income to be set off aginst the cost of the general enterprise at 'Grove Place' will be realised It must, however, be obvious to all familiar with the breeding of stock that a few years will be required before this can be brought about and that the present condition of 'Grove Place' after over a century of not very successful management under 'old-fashioned' conditions involves an immense amount of work to be done before the property can be placed in a condition to give adequate commercial results.

Silos, fodder crops, improved water supply and Sanitation, cultivation and manuring of grass pieces, resuscitation of pastural areas now over-grown in bush, restoration of Sub-divisions are all essential for a successful outcome for this enterprise.

The former business of 'Grove Place' as based on a herd of beef cattle has been found on investigation to be a very poor one indeed The records of 112 cows from the 'Grove Place" herd which we purchased at the sale in July 1920 show that these breeding animals had required an average period of 26 months between calvings. In other words the breeding machinery was operating at a loss of at least 50 per cent.

We have since drafted 16 of these cows to the butcher after a special period of fattening in guinea grass and their average live weight on the farm was only 948 lbs. or less than that of our Jersey Cows at Hope under similar conditions.

These poor results were apparently due to lack of good Sires and of selection of the cows reserved for the breeding herd.

Ticks and lung-worm parasites also played a serious part in reducing the thriftiness of the cattle.

The feeding of breeding cows on "bare common" was apparently responsible for the slow breeding of the herd. The plans of the management for the future are briefly as follows:—

(1) To transform the herd into a Dairy Herd by the use of selected Dairy Bulls on the foundation of miscellaneous native cows now assembled at 'Grove Place' and the rearing of half-bred dairy heifers with which a start in dairying can be made in three years' time.

(2) To earn income during this period of suspended activity by selling the bull calves to small cattle breeders in the district and rearing dairy heifers and selected dairy bull calves from the Hope Farm.

In 1921 an income of £345 was realised from this source and with more calvings in the coming year an income of £500 has been estimated for.

As regards the precise form in which the Dairy Enterprise should be developed it is yet too early to decide. The various possibilities are:—

(a) Sale of fresh milk to a Condensed Milk Factory or in Kingston as fresh milk.

(b) Manufacture of butter and use of the separated milk for rearing dairy bred heifers.

(c) Breeding and rearing superior dairy bred heifers and cows for sale.

It is quite evident that either of these three courses would ultimately give a far greater financial return than the old business of breeding nondescript cattle for sale to the butcher.

An important department of the work at 'Grove Place' is that of breeding horses, mules and Proof asses.

The old thoroughbred Stallion "Water Jacket" originally purchased for the Hope Farm in 1909 has now been transferred to 'Grove Place'. In 1921 this Sire served 63 mares.

The first fold born at 'Grove Place' by "Water Jacket" out of "Glee" (a granddaughter of 'St Simon') and registered by the Jamaica Jockey Club as "Blazer" has developed into a fine colt and weighed 690 lbs. at a year old.

This foal was purchased by a leading racing enthusiast for £80.

The imported jack "Kentucky Boy" was in good demand and served 41 mares in his first Season. This Jack has greatly improved in Jamaica. When first landed from the United States in 1920 "Kentucky Boy" weighed 800 lbs He now weighs 1,080 lbs. and has developed into a magnificent specimen. In July jennies will be accepted for service by "Kentucky Boy", at the same fee as for mares, viz:—£2. The Season for jennies will close at the end of December.

The Annual Valuation of the Live Stock at 'Grove Place' was made by the Director with the assistance of the Stock Manager on December, 26th 1921.

As with all progressive enterprises which were launched during the period of high prices in 1920, we were faced with a serious depreciation in value. It was decided that the full effect of the drop in prices should be accepted in making the valuation, and this was done to the best of the ability of the Valuators.

The results may be summarised as follows:—

		Valuation 1921		Cost 1920.
Cattle	(302)	£3,254	(246)	£ 4,220
Horsekind	(43)	1,137	(36)	1,465
Total	(345)	4,391	(284)	5,685
Decrease in value over first cost		£1,294		

The breeding herd will require a considerable amount of culling, and useful records are being kept of the weights for age of the calves reared by each cow so that only animals with good milking capacity will be retained in the herd. Cows that refuse to accept foster calves will also be eliminated as our present system requires that the bull calves should be sold at birth and foster calves of superior merit be substituted.

The rainfall at Grove Place for 1921 was a follows:—

Grove Place, Rainfall Record, 1921

January	3.24	inches
February	5.32	"
March	7.03	"
April	8.47	"
May	12.80	"
June	4.44	"
July	1.53	"
August	4.55	"
September	12.55	"
October	6.62	"
November	2.56	
December	.54	
Total	69.65	inches.

At the time of writing, this part of Manchester has been suffering from a severe drought extending over 6 months. But for the re-establishment of our acre of barbecue catchment in 1920 and the repair of the concrete reservoirs a very serious position indeed would have had to be faced. It is now evident that the utmost efforts must be directed towards improving the water supply of 'Grove Place' and plans to this end are already in hand.

List of Stock, "Grove Place Pen."
1921.

Cattl —

8 Bulls	2 Zebu-Jersey Bulls 'Experiment' & Hon. Mr. Polo
	4 Bull calves 1920
	2 Grade Holstein Bull calves 1921
229 Breeding Cows	8 Native breeding cows purchased from Hope
	24 Native Holstein Cows from Carton, St. Ann's
	15 Native Red Polls from Carton, St. Ann's
	39 Native Breeding Cows from Copse, Hanover
	29 Native Breeding Cows from Grier Field, St. Ann's
	11 Native Breeding Cows from Mt. Plenty, St. Ann's
	103 Native Breeding Cows from Dr. Halliday.
62 Heifers	1 Grade Red Poll Heifer
	1 Grade Jersey Heifer
	20 Native Heifers
	6 Grade Holstein Heifers
	1 Grade Swiss Heifer
	1 Zebu-Jersey Heifer
	32 Grade Jersey Heifers
3 Plough Steers	3 Plough Steers
302 Total	

Horsekind

1 Imported Thoroughbred Stallion "Water Jacket'
1 Imported Proof Ass "Kentucky Boy"
14 Brood Mares
4 Fillies
2 Horse Colts
2 Geldings
15 Mules
4 Donkeys
43 Head

STATEMENT OF REVENUE AND EXPENDITURE ON GROVE PLACE WORKING ACCOUNT FROM 1ST SEPTEMBER 1920 TO 31ST MARCH, 1921.

	£	s	d	£	s	d
Revenue						
Rearing Calves	281	9	0			
Sale of Stock	41	0	0			
Services and Pasturage	62	16	0			
Rents	30	7	0			
Sale of Produce	2	14	0			
Dipping Tank Receipts	17	2	4			
Miscellaneous	0	16	5	436	4	9
Expenditure						
Wages	120	15	7			
Repairs fences, etc	35	19	0			
Cultivation Expenses	61	4	6			
Transfer of Stock	21	2	9			
Taxes	3	6	11			
Miscellaneous	113	9	8½	355	18	5½
Credit Balance 31st March 1921				* 80	6	3½

* The sum of £82 7/3 remained unlodged on the 31st March, 1921 The Treasury Account therefore shows a Debit Balance of £2 0s 11½d to 31st March 1921.

GROVE PLACE WORKING ACCOUNT.
1921-1922.

	£	s	d
Expenditure—			
Wages	339	19	5
Repairs Tools, etc	214	6	6½
Up-keep of property	285	15	2½
Crops	40	2	3½
Food and Drugs	112	16	11½
Miscellaneous	112	10	5
Stud Expenses	79	14	0
Transport	30	13	10
Rearing Calves	24	10	0
Cleaning:			
Pastures 89 19 11½			
Commons 160 4 1½ ..	250	4	1
Travelling Expenses	25	15	0
Purchase of Stock	373	14	3
Taxes	8	10	0
	£1,898	12	0
Revenue—			
Sale of Stock	249	4	2
Rearing Calves	343	12	0
Stud and Pasturage	279	10	10
Rents	41	8	6
Produce	143	15	10½
Dipping Fees	40	13	8
Miscellaneous	7	13	1
	£1,105	18	1½
Less amount unlodged	4	19	7½
Amount lodged to 31 3.22	£1,100	18	6
Excess Expenditure 1921-1922	797	13	6
" " 1920-1921	2	0	11½
Total Debit balance to 31.3.22	£799	14	5½

Government Stock Farm, Hope.

As twelve years have now elapsed since the enterprise at Hope described as "The Government Stock Farm" was first established, I consider it desirable to present a summary of its operations during that period.

The Farm at Hope was started in 1910, under the administration of Sir Sidney Olivier, K.C.M.G., in order to provide a Dairy Farm as an agricultural basis for the newly established "Farm School." The surplus lands belong to Hope Gardens that were then mostly in ruinate were available for this enterprise and by clearing and planting afforded about 50 acres of useful grass lands. As this area was not adequate for a serious enterprise, the waste lands of the Old 'Hope Estate,' that still remained in the original ownership of the Duke of Buckingham's Estate after the sale of the Sugar lands and the water supply of Hope for the purposes of the Liguanea and Kingston Water Works in 1849, were leased for an annual rental of £200 per annum. These lands consisted of 1,600 acres in all but only a small proportion was suitable for graizng purposes and these areas had been allowed to grow up into heavy jungle. The fences were also in very bad condition.

At the commencement of the financial year, 1010-1911, s Stock "Farm Working Account" was opened at the Treasury by special authority of the Secretary of State for the Colonies. To this "Working Account" all revenues are credited and the expenditure of the Farm is debited.

For the first three years the Farm had to pay the rental of £200 per annum. Since 1913, however, no rent has been paid as the Government purchased the Hope Estate for £5,443 in that year and has since allowed the Farm the free use of the property.

With some fluctuations, the Farm has during the 12 years steadily paid its way on the Working Account, and is now approximately in a state of even balance. On the other hand, substantial value has been developed in the Public property at Hope by the improvement of the Estate and the development of the Dairy Herd.

The Farm has, out of its own earnings, expended the sum of £3,193 in clearing, stumping, planting and fencing the lands of Hope Estate and in establishing Water supplies so that at the present time about 420 acres of the old Hope lands have been cleared, fenced, watered and planted in guinea grass. There are about 5,000 old Mango trees on the property; mostly on "Liguanea Ridge" and 'Blue castle Pasture." These are being headed back and budded to the "Bombay" variety. About 1,200 trees have now been converted from inferior seedlings varieties to the choice "Bombay Mango."

When this enterprise is complete there will be a fine orchard of Bombay mangoes at Hope Farm from which an export trade in choice mangoes might be started. At present the local demand exceeds our supply of this fruit.

A Balance Sheet has been published annually in the Departmental Report. This shows the annual improvement in the Assets of the Farm, but ignores the value of the expenditure on the property.

For the last six years the Balance Sheets have shown an average annual increase of £1,132 in the Assets of the Farm.

If the Farm were charged for its Capital at 5 per cent. this would imply a charge of £389 per annum.

Capital of Hope Farm from General Revenue.

	£	s.	d.
Cost of Property	5,443	0	0
Cost of Live Stock from General Revenue ..	2,341	0	0
Total Capital from General Revenue ..	£7,784	0	0

These figures show that the Farm has, in fact, been a successful business enterprise as it has furnished for the last six years a surplus of £743 per annum over estimated interest charges, while in addition over £3,000 has been expended in developing the property.

Only a few of these native cows have left any decendants in the present herd.—Of the original native cows the following deserve commendation and have useful decendants in our present herd:—

The Dairy Herd.

The first animals obtained for the Hope Farm were a few cows purchased in the island. Most of those were absolutely valueless for dairy purposes and we gained occasional experience of the "Ananias Ratio" when applied to the sale of milch cows with declared capacity for giving milk.

Annie, Black Bess, Kitty	(M. P. DaCosta).
Big Bess, Molly ..	(Miss Austin).
Vera, Roan ..	(H. T. Ronaldson).
Distance, Kate, Una	(G. S. Ewen).
Buttercup, Dove	
Red Girl, White Leg, Violet	(H. M. Brandon).

The most valuable of these cows was the quarter-bred Nellore cow "Distance," bred at "Weston Favell" by the Honourable Guy S. Ewen.

She produced two remarkable dairy sires in her sons "Experiment" and "Tipperary," while her daughter "Mirage" is also a valuable foundation cow. These three progeny were by three different pedigree Jersey Bulls. General Revenue has at various times previous to 1913 supplied money for the importation of Stock for the Hope Farm. The total of this contribution is £2,341.

The vote on the Estimates of 1913-1914 was cancelled and the Farm has since been compelled to supply its own funds for importations of Live Stock.

These have been as follows:—

Cattle.	£
1913.	60
1917.	428
1919.	1,327
1920.	1.361
1921.	684
	£3,860
Poultry	214
Total	£4,074

The losses inherent to the importation of valuable pedigree cattle from Northern Climes are considerable despite the utmost care and skill. The cost of feeding and attending to these delicate animals is also much greater than for native cattle. For example, in 1921 we imported a splendid Guernsey bull from the herd of Her Royal Highness the Duchess of Albany. This animal died a few months after landing and has left us 8 heifer calves and 6 bull calves.

The cost of this bull divided up among the 8 heifers works out at £28 per head for the first cost of the Sire.

I have no doubt that the importation of this Guernsey bull will prove a definite financial success later on, but at the moment such an experience is represented by a deficit in the finances of the Farm.

The Herd at present contains pedigree stock of the following breeds:—

Jersey, Guernsey, Ayrshire, Holstein, Frisian, Red Poll and Brown Swiss, besides an imported Montgomery or "Sanhiwal" bull of this Indian Dairy breed.

At the last valuation in December, 1921, the Live Stock at Hope stood at £9,256 showing a gain of £6,915 on the original investment from general revenue.

As an illustration of the value and capacity of native bred cows attention may be called to the first twelve native Dairy cows in the milk yield record for 1921, which gave over £1,000 worth of milk during the year or an average of over £80 per cow.

If several hundreds of such cows were generally available, the people of Jamaica would soon be in a position to supply their own needs for dairy products. That this can be done has been amply proved at the Hope Farm.

In order to obviate the depressing effect of drought on the milk yield of native dairy cows it is necessary to supply silage.

In 1921 300 tons of excellent guinea corn silage were produced in the three Silos at the Hope Farm. If more Silo capacity had been available our guinea corn crop would have sufficed for 600 tons of Silage to the great advantage of our present operations when acute conditions of drought have prevailed for over 6 months.

The large concrete silo erected by the Public Works Department in 1920 has been found a great success and has produced the finest lot of Silage (200 tons) ever made at Hope.

The two 50 ton wooden Silos erected in 1910 have now become so rotten as to be beyond repair. The Public Works Department, however, succeeded in patching them up temporarily and we were able to obtain an early supply of Silage from these two structures.

It is imperative that a new Silo be constructed of concrete and it is hoped that this may be done at an early date in order to place the Hope Farm in a safe position for withstanding conditions of drought.

The engine equipment has been greatly improved during the year. We were fortunately able to purchase, at half the original price, a Fairbanks Super-Diesel Oil Engine of 20. H.P This operates on fuel oil and can be run for 6d. per hour as against 5/ per hour for our old gasolene "Geiser" Engine of the same horse power.

Work is now being carried out in making a machine shed and erecting shafting, pulleys, friction clutches, etc.

The Public Works Department presented us with a new 12 H.P. International Harvester Kerosene Engine which formed part of an abortive "Rice Factory" at Fish River erected by the Food Controller. This will be a useful addition and is being fitted up to pump pressure in the starter tanks of the Super-Diesel Engine and for operating our feed mill.

Finally, our original "Geiser" 20 H.P. Gasolene Engine has been overhauled and after eleven years of hard work is now in excellent working condition.

The value of machinery in fighting drought conditions in a dairy farm in making Silage, grinding feed, shredding sugar canes, is seen by the result of our last 6 months work at Hope in which an average of nearly 300 quarts of milk per day has been maintained, despite a fall of only 6 inches of rain in the half year.

Guango-pods have been stored every year for the past five years.

The crop in 1921 was poor and damaged by rain.

For 1922 we have stored 100 tons of guango at 'Hope' and 45 tons at 'Grove Place'

'Uba' Cane has been found a splendid fodder for cows in dry weather, when flavoured with a little cotton seed meal it is greedily devoured by the cows.

We have also hopes of the new Brazilian grass introduced from Columbia by W. W. Wynne, Esq, of Brockenhurst, Manchester. This grass has been identified by Dr. N. L. Britton of the New York Botanic Gardens to be *Melinis Minutiflora* This grass may be described as a "Super-Para Grass." It is very resistant to drought and has killed out all competitors, including Para Grass at Hope. It possesses a peculiar aroma but this does not prevent cattle from eating it with relish.

It has been proved not to affect the flavour of milk by feeding a cow on the grass exclusively for two weeks. Favourable reports on this grass have been received from Major Malcolm of Knockalva and from H. T. Ronaldson, Esq, of Stone's Hope. We hope to extend its cultivation with great advantage at both 'Grove Place' and 'Hope' and have named it "Wynne Grass" in honour of its introducer into the island.

Dairy Bulls—Since its inception the stock farm at Hope has issued to the public 242 dairy bulls. The result from these sires are now coming into evidence, and are steadily increasing from year to year.

Many country breeders have made a handsome profit through buying our bull-calves and rearing them on a native cow.

For example, a Red Poll calf was purchased at Hope for £3 and was sold at two years of age for £50.

Supply of Milk to Public Institutions.

The original intention in establishing a Dairy Farm at Hope was that the Public institutions in Kingston should be thereby supplied with a reliable output of pure, fresh milk. The Public Hospital, Kingston, suffered from the supply of milk much below the legal standard which was also fluctuating in amount, and since July, 1910 the Hope Farm has enabled this institution to obtain a regular supply of milk which has averaged 4.76 per cent of milk-fat.

This standard is more than 25 per cent. above that previously supplied by the contractors.

The price of milk was originally priced at 5d. per quart (delivered twice daily) and this price was continued until January, 1920.

In September, 1917 the Lunatic Asylum decided to take fresh milk from the Farm so as to replace the Condensed Milk previously supplied to the inmates. During the war the Farm was able to maintain a good daily supply of fresh milk to the Public Institutions in Kingston even when condensed milk was almost unobtainable.

In 1918 and 1919 although the price of condensed milk had risen owing to war conditions, the Hope Farm continued to supply fresh milk at the old price and thereby contributed £800 per annum towards the upkeep of the public institutions in Kingston.

In 1920 the Food Controller fixed a price of 7d. per quart for the first quarter, 8d. per quart for April and May and 11d. per quart in June. This price was continued throughout 1921 and was justified by the relative cost of condensed milk and the local market price for fresh milk.

In 1922 prices have fallen and the Government has now fixed the price of the milk from the Home Farm at 8d. per quart for the first quarter of the financial year when it will be subject to review.

GOVERNMENT STOCK FARM, HOPE.

On the 31st December 1921, the Live Stock belonging to the Government Farm at Hope consisted of the following animals:—

CATTLE.

Pedigree Stock:—

43 Red Polls	....	1 Imported Red Poll Bull
		9 Native Red Poll Bulls
		6 Imported Red Poll Cows
		27 Native Red Poll Cows and Heifers
31 Jerseys	.. ..	2 Imported Jersey Bulls
		1 Native Jersey Bull
		7 Imported Jersey Cows
		21 Native Jersey Cows and Heifers
6 Guernseys	.. ..	2 Native Guernsey Bulls
		2 Imported Guernsey Cows
		2 Native Guernsey Heifers
6 Ayrshires	.. ..	1 Imported Ayrshire Bull
		2 Native Ayrshire Bulls
		2 Imported Ayrshire Cows
		1 Native Ayrshire Heifer
6 Brown Swiss	.. ..	1 Native Brown Swiss Bull
		5 Native Brown Swiss Heifers
1 Holstein	.. ..	1 Imported Holstein Bull
31 Zebu-Jerseys	.. ..	1 Zebu-Jersey Bull
		31 Zebu-Jersey Cows and Heifers
1 Montgomery Bull	..	1 Imported Montgomery Bull
		125

Non-Pedigree Stock:—

	4 Grade Guernsey Bulls
	3 Grade Holstein Bulls
	2 Grade Red Poll Bulls
	2 Grade Zebu-Jersey Bulls
	3 Grade Swiss Bulls
	5 Canadian Dairy Cows
	66 Native Dairy Cows
	3 Native Breeding Cows
	4 Native Heifers
	14 Grade Zebu-Jersey Heifers
	6 Grade Jersey Heifers
	21 Grade Guernsey Heifers
	26 Grade Holstein Heifers
	5 Grade Red Poll Heifers
	7 Grade Swiss Heifers
	1 Grade Ayrshire Heifer
Total Non-Pedigree Cattle	172
	11 Steers.
Total No. of Cattle ..	308

HORSEKIND.

1 Gelding
8 Working Mules

POULTRY.

4 Pens—
Rhode Island Red
Plymouth Rock
Indian Game
White Leghorn

BEES.

20 Colonies.

WEEKLY ANALYSES OF MILK SUPPLIED TO THE PUBLIC HOSPITAL AND LUNATIC ASYLUM BY THE STOCK FARM, 1921 1922.

Quarter ending.	Solids.	Fat.	Sp. Gravity.	Solids not Fat.
June 30, 1921	12.93	4.42	1.0301	8.51
September 30, 921	13.21	4.62	1.0300	8.59
December 31, 1921	13.13	4.61	1.0298	8.52
March 31, 1922	12.82	4.31	1.0299	8.51
Av. for the year 1921-1922	13.02	4.49	1.0299	.53

The following is the summary of the valuation of Live Stock at the Farm on the 31st December, 1921.

Cattle	£8,962
Horsekind	198
Poultry	71
Bees	25
	£9,256

RECORD OF DAIRY HERD MILK YIELD 1921.

Month.	Av. No. of Cows.	Total Qts. per mensem.	Av. per Cow Qts.
January	53	6,172.4	3.7
February	59	8 152.6	4.9
March	66	10,502.2	5.1
April	67	10,156.0	5.1
May	69	9,586.8	4.5
June	67	9,120.9	4.5
July	73	9,253.7	4.1
August	71	8,950.7	4.1
September	69	9,983.4	4.8
October	67	8,921.3	4.3
November	63	7,905.0	4.2
December	66	8,351.8	4.1
Average ..	66	107,056.8 Qrts.	4.5

MILK YIELD, DAIRY HERD 1917, 1918, 1919, 1920, 1921.

Imperial Quarts per diem..

Month.	191 .	1918.	1919.	1920.	1921.
January ..	203.8	282.4	280.8	279.8	199.1
February ..	2 4.1	257 5	305.1	299.8	291.2
March ..	193 5	231.9	268.7	245.1	238.8
April ..	223.8	265.9	276.7	239.6	338.5
May ..	266.7	226.1	383.6	194.5	309.3
June ..	258.7	211.8	394.4	190.2	304.0
July ..	249.7	312.7	308.8	194.7	299.0
August ..	229.3	273.7	286.2	186.5	288.7
September ..	248.0	302.7	312.7	207.1	332.8
October ..	273.4	298 3	316.7	250.7	287.8
November ..	281.3	378.0	255.0	286.8	263.5
December ..	268.2	318.3	241.5	230.6	269.4
Average	242.5	273.2	302.5	233.8	293.5

Stock Farm Working Account 1921-1922.

Revenue:—

	£	s.	d.			
Stud and Pasturage	20	0	0			
Tenants	63	7	4			
Sale of Stock	420	14	6			
Milk	4,813	1	1½			
Poultry	10	12	6			
Miscellaneous	183	12	10			
Sale of Stock Feeds, etc.	336	0	7			
Cordwood	282	10	0			
Sale of Lands	206	7	1	£6,336	1	11½

Expenditure:—

Motor Van	17	3	3			
Wages	799	10	11			
Repairs and Implements	802	18	0			
Food for Stock	1466	1	2			
Purchase of Stock	435	13	0			
Rearing Calves	343	12	0			
Foreman	120	0	0			
Miscellaneous	588	5	1			
Cordwood	258	7	5			
Clearing & Fencing	501	6	1	£5,333	6	9
Excess Revenue				1,003	9	2½
Cash Deficit 1.4.21				1,330	17	5
Cash Deficit 31.3 22				327	8	2½

Live Stock Capital Account 1921-1922.

Capital Estimates:—

1909 1910	£500	9	0
1910-1911	247	0	0
1911-1912	883	12	4
1912- 913	710	0	7
1913-1914			
1914-1915			
19 -1915			
1916 1917			
1917-1918			
1918-1919			
1919-1920			
1920-1921			
1921:-1922			
Total Capital from General Revenue	2,341	1	1
Valuation 31st March, 1922	9, 88	0	0
Balance at credit 31.3.22	6,846	18	1
Balance at credit 31.3.21	7,336	18	1
Reduced Value during year 1921-1922	490	0	0

Progress Record.

Balance at credit 31.12.12	£1,237	8	1
,, ,, 31.12.13	1,022	3	1
,, ,, 31.3.15	627	9	7
,, ,, 31.3.16	567	4	1
,, ,, 31.3.17	1,077	19	1
,, ,, 31.3.18	2,041	6	1
,, ,, 31.3.19	2,821	12	1
,, ,, 31.3.20	4,587	18	1
,, ,, 31.3.21	7,336	18	1
,, ,, 31.3.22	6,846	18	1

MILK YIELD, 1921, DAIRY HERD, HOPE STOCK FARM.

Order.	Cow.	Breed.	Age in yrs.	Av. Cont. Milk Fat.	Lbs. of Milk.	Milking Weight.	Max. Yield Imp. Qrts.	Sale Value of Milk at 11d. per qt. £ s. d.
1	Lydite	Holstein Ayrshire	10	4.3	5,830	980	10.8	103 3 3
2	Shrew 1st	Grade Guernsey	7	4.8	4,740	954	12·6	83 18 9
3	Badge	Zebu-Jersey	8	3.8	4,716	1,000	11.4	83 10 4
4	Carmen	Grade Guernsey	7	4.1	4,656	694	9.7	82 9 0
5	Pobess	Grade Red Poll	7	4.2	4,548	1,036	10.2	80 10 9
6	Pansy	Amer. Jersey	11	4.9	4,543	912	10.9	80 8 10
7	Bunny	Grade Holstein	5	4.5	4,531	1,054	10.8	80 4 9
8	Foxy 1st	Zebu-Jersey	4	4.0	4,485	794	7.0	79 8 5
9	Lizzie	Grade Jersey	10	4.9	4,442	1,030	12.6	78 13 2
10	Fifi	Grade Jersey	6	4.4	4,404	778	12.1	77 19 9
11	Shrew 2nd	Zebu-Jersey	6	5.7	4,344	1,120	11.6	76 18 6
12	Marchioness 1st	Zebu-Jersey	5	4.2	4,199	818	9.1	74 7 2
13	Norbrook	Indian Ayrshire	7	4.7	4,159	1,070	11.2	73 13 0
14	Timorette	Zebu-Jersey	6	5.7	4,149	780	9.7	73 9 6
15	Fit	Grade Jersey	5	4.8	4.038	916	10.7	71 10 2
16	Diva 2nd	Grade Zebu-Jersey	6	5.1	4,011	828	10.5	71 0 7
17	Fess	Grade Jersey	7	4.3	3,993	730	10.3	70 14 2
18	Ladysmaid	Red Poll	9	3.8	3.975	940	8.0	70 7 10
19	Violet 2nd	Grade Zebu-Jersey	4	4.2	3,962	856	12.2	70 3 2
20	Perfection	Amer. Jersey	6	4.9	3,924	962	15.5	69 10 4
21	Honeybelle	Amer. Jersey	11	5.8	3,894	818	13.2	68 19 0
22	Ellenstine 2nd	Zebu-Jersey	4	4.2	3,846	630	8.9	68 2 2
23	Dolly	Zebu-Jersey	7	4.8	3,841	992	10.9	68 0 4
24	Fanny	Grade-Jersey	10	5.0	3,776	898	8.4	66 17 4
25	Hope Brisk	Red Poll	6	3.3	3,757	942	9.0	66 10 9
26	Beta	English Red Poll	10	4.0	3,714	930	8.9	65 15 5
27	Freda	Grade Holstein	5	3.9	3,694	945	9.9	65 8 2
28	Diva	Grade Guernsey	10	5.2	3,625	860	10.6	64 3 9
29	Ethelstine	Jersey	5	4.2	3,566	708	10.2	63 3 0
30	Rosette	Grade Guernsey	7	4.6	3,551	810	9.3	62 17 7
31	Monica 1st	Grade Zebu-Jersey	6	3.9	3,534	844	9.1	62 11 6
32	Para	Grade Holstein	3	4.4	3,512	970	10.6	62 3 11
33	Pride's Monica	Grade Guernsey	7	4.1	3,451	730	9.5	61 2 1
34	Quail 2nd	Zebu-Jersey	4	4.6	3,450	720	6.8	61 1 11
35	Matilda 2nd	Grade Jersey	4	4.5	3,431	720	8.7	60 15 4
36	Filda	Grade Red Poll	8	4.2	3,429	1,219	7.2	60 14 5
37	Pussy	Grade Red Poll	6	4.3	3,402	922	10.8	60 4 10
38	Hope Pansy	Jersey	5	5.1	3,595	710	7.5	60 2 5
39	Purity	Amer. Red Poll	7	3.4	3,384	1,330	19.0	59 18 6
40	Nana	Grade Holstein	4	4.7	3,270	850	9.1	57 18 1
41	Melinite	Grade Zebu-Jersey	4	5.3	3,266	790	8.0	57 16 7
42	Butterfly	Amer. Jersey	3	5.9	3,224	932	7.1	57 1 10
43	Hope Beta 2nd	Red Poll	12	3.5	3,224	680	6.7	57 1 8
44	Diva 4th	Grade Zebu-Jersey	4	4.3	3,182	890	9.5	56 6 9
45	Monica 2nd	Grade Zebu-Jersey	5	4.3	3,176	912	6.3	56 5 6
46	Hope Beta 1st	Red Poll	4	4.3	3,174	872	9.5	56 4 2
47	Desiree 1st	Red Poll	5	4.4	3,167	830.	9.3	56 1 7
48	Cordite 2nd	Grade Zebu-Jersey	4	4.9	3,137	610	5.7	55 11 0
49	Blossom 1st	Grade Zebu-Jersey	3	4.4	3,093	690	7.8	54 15 7
50	Casilda 2nd	Grade Zebu-Jersey	3	4.2	2,926	760	8.4	51 16 3
51	Badge 1st	Zebu-Jersey	5	5.9	2,850	818	6.2	50 9 4
52	Fanny 1st	Grade Red Poll	6	4.2	2,776	880	7.2	49 3 4
53	Vickie A.	Zebu-Jersey	4	5.2	2,765	630	5.0	48 19 1
54	Hope Pretty 1st	Red Poll	4	3.5	2,740	730	7.1	48 10 5
55	Solo 2nd	Grade Zebu-Jersey	5	3.9	2,714	976	7.1	48 1 4
56	Hope Patridge 1st	Jersey	3	5.6	2,711	758	7.6	48 0 2
57	Lady Geneva	Amer. Red Poll	6	5.1	2,673	1,100	8.0	47 6 8
58	Cigarette	Grade Guernsey	10	4.4	2,560	980	10.9	47 2 2
59	Cigarette 1st	Grade Zebu-Guernsey	6	4.9	2,657	760	5.8	47 1 10
60	Fanny 2nd	Zebu-Jersey	3	4.2	2,613	760	7.3	46 5 5
61	Dora	Grade Jersey	6	4.8	2,600	760	5.6	46 0 10
62	Hector's Ethelstine	Jersey	3	4.6	2,595	670	6.6	45 19 1
63	Claretcup 1st	Grade Zebu-Jersey	3	4.6	2,593	718	5.5	45 18 5
64	Monica 3rd	Grade Zebu-Jersey	4	5.0	2,542	616	8.3	45 0 2
65	Hope Mead 1st	Jersey	3	5.1	2441	776	5.9	43 4 4
66	Gertie	Grade Holstein	4	4.7	2,414	978	8.2	42 14 11
67	Monica	Grade Guernsey	11	4.4	2,394	1,052	10.2	42 7 10
68	Hector's Ellen	Jersey	3	4.8	2,391	642	6.8	42 6 2
69	Rum	Grade Jersey	5	5.2	2,318	870	7.1	41 0 11
70	Lady Greta	Red Poll	4	4.5	2,205	1,136	12.3	39 0 11
71	Beryl	Quarter Holstein	3	4.3	1,896	806	2.8	33 11 4

PROVISIONAL BALANCE SHEET TO 31ST MARCH, 1922.

		£ s. d.		£ s. d.
Live Stock net purchase 1909-21		2,583 17 2	Live Stock	9,188 0 0
Live Stock purchases 1921-1922 ..	435 13 0		Dead Stock and Buildings ..	1,234 2 11
Live Stock Sales 1921-1922 ..	420 14 6	14 18 6	Food	170 13 6
			Accounts receivable ..	485 14 1
			Kintyre Pen	300 0 0
Accounts payable ..		12 8 9		
Debit Balance at Treasury		327 8 3		
		2,938 12 8		
Balance Assets ..		8,439 17 10		
		11,378 10 6		11,378 10 6

	£ s. d.
Balance Assets, 1921-1922 ..	8,439 17 10
Balance Assets, 1920-21	7,644 0 0
Improvement in year's work ..	795 17 10

PROGRESS RECORD.

	£ s. d.
Improvement on years work 1916-17 ..	825 3 7
" " 1917-18 ..	995 1 6
" " 1918-19 ..	584 7 5
" " 1919-20 ..	3,093 6 11
" " 1920-21 ..	588 9 5
" " 1921-22	795 17 10
Average for six years	1,147 1 1

VIII.—DEPUTY ISLAND CHEMIST.

Sir,

I have the honour to submit the following report on the work done at the Government Laboratory during the year ending 31st December, 1921.

The total number of samples dealt with was 1,233, as compared with 926 for the nine months ending 31st December, 1920, and 1,380 in the previous official year.

These may be classified as follows:—

(i) *Police:—*

Human Viscera and Organs	30
Stomach contents, Vomits, etc. ..	8
Animal Viscera	1
Substances examined for poison ..	26
Medicines	1
Arson Exhibits	1
Ganga	14
Counterfeit coins	10
Genuine coins	2
Counterfeit Currency notes	1
Sugars	1
Butters	2
	97

Under the Petroleum Laws —

Kerosene Oils	4
Gasolenes	4

Under the Spirit License Laws—

Rum	1

Samples taken under the Adulteration of Food and Drugs Law 25 of 1908.

	Genuine.	Adulterated.	Total.
Fresh Milks	16	2	18
Butter	2	1	3
Margarine	2	..	2
Lard	2	..	2
Port Wine	..	3	3
	22	6	28
Total Police			124

(ii) *Customs—*

Natives Wines	58
Rectified Spirits & Absolute Alcohols	33
Denatured Alcohols	5
Disinfectants	5
Rums	4
Essences & Extracts	4
Whisky	3
Condensed & Dried Milks ..	3
Lubricating Oils	3
Sherry & Port Wines	3
Brandy	1
Turpentine	1
Locally made "Gin"	1
Locally made "Whisky" ..	2
Locally made "Brandy" ..	1
Miscellaneous	8
Total	135

(iii) Public Works Department—

Clays	3
Muds	1
Waters	2
Oils	1
Plaster of Paris	1
Total	8

(iv.) Jamaica Government Railway—

Coals	10
Waters	1
Total	11

(v.) Medical Officer of Health, Kingston—

	Genuine.	Adulterated.	Total.
Fresh Milk	3	9	12
Total	3	9	12

(vi) Parochial Boards—

Water, potable	8
Total	8
Total Official ..	308

"B." Agriculture.

Soils and Sub soils	14
Fertilizers	3
Agricultural Limes	2
Canes	21
Cane Juices	7
Begasses	10
Orange Oils	6
Feeding Stuffs	1
Molasses & Dunders ..	5
Tobacco Waste	2
Total ..	71

"C." General.

Stock Farm Milks	594
Cattle Dips	67
Waters, Potable	27
Water Boiler	3
Water Irrigation, etc. ..	14
Rums	42
Sugars	34
Condensed Milks	9
Fresh Milks	2
Human Milks	1
Native Wines	8
Whiskies	2
Substances for Poison	7
Animal Viscera for Poison	6
Minerals	7
Rat Poisons	4
Foods Private	4
Coals	3
Gasolines	2
Encrustations for Boilers, etc. ..	10
Polariscope (For test & adjustment) ..	1
Oils (Fixed & mineral)	2
Miscellaneous	5
Total	854
Grand total	1 233

Official Samples.

The 38 analyses of human organs, stomach contents, etc., were made in connection with 18 deaths. In one case only was poison found and recovered from the viscera.

1. 40 grains Arsenous Oxide from the organs of the exhumed body of a man.

Organs were submitted from a number of cases of so-called "Akee Poisoning." In none of these was poison found. It is, however, noteworthy that in a large proportion of cases of death from so-called "Akee Poisoning" in which the intestines were forwarded these were found to contain large numbers of round worms (*Ascarides Lumbricoides*), the worms in some cases forming almost impassable masses in the intestines. In one case no less than 100 of these parasites were removed from a single intestine. It is interesting to note that the presence of ascarides in large numbers in the intestines has been noted as the only abnormal post mortem condition in a large number of so-called "Akee Poison" cases since 1886, when the late J. J. Bowrey was Island Chemist.

In the samples suspected of containing poison were found:—
1. ½ oz. Arsenious Oxide.
2. 15 grains powdered glass in food.
3. Asafetida in Rum.
4. 4 grains powdered glass in food.
5. 25 grams Caffeine Citrate in a powder.
6. Hydrocyanic Acid from Bitter Cassavas.
7. 1-8 grains phosphorous in food.
8. 17 grains Arsenious Oxide in a Breadfruit.
9. 27 grains Ammoniated Mercury in water.

The number of samples taken under the adulteration of Foods and Drugs Law continues to remain less than in former years. This is to be regretted, more especially in the case of fresh milks, in view of the large percentage of adulterated samples examined here from year to year. Of 12 samples of fresh milk examined for the Medical Officer of Health for Kingston, 75 per cent. were found to be adulterated, the amounts of added water varying from 3 per cent to 66 per cent. One of these samples was also found to contain large traces of boric acid.

Several water supplies were examined on behalf of various Parochial Boards during the year and reports made thereon.

Owing to the activity of the Revenue Department the manufacturer of a local concoction of rum and flavour was convicted for selling the same as "Sherry." It is a source of satisfaction to note that owing to the activities of the Revenue and Police Departments, most manufacturers of locally concocted Port and Sherry wines now no longer claim the designation Port and Sherry for their concoctions.

Of the 10 counterfeit coins examined on behalf of the Police 9 were found to be made entirely of tin. One coin was found to be composed of Silver, Copper and Zinc.

Agricultural.

Various analyses of Soils, Fertilizers, etc., were carried out during the year on behalf of the public.

Complete analyses of 12 varieties of canes were made in connection with experiments of the Superintendent of Agr cu ture at various centres.

Experiments conducted with ' Dalroc" Rat Exterminator obtained from the Jamaica Agricultural Society proved the preparation to be a genuine Extract of Red Squills (*Scilla Maritima*), deadly to rats, while being practically harmless to domestic animals. Previous experiment conducted with squill bulbs obtained from the United Kingdom proved that the extract from White Squill is non-toxic to rats.

General.

The quarterly examination of the Kingston Water Supplies were carried out as ususal. These waters remained of good organi purity throughout he year

The minerals examined during the year were mostly samples of Iron Pyrites; one sample of Calc Spar, and one of Soapstone (Magnesium Silicate) were examined, as well as two Copper ores.

The systematic examination of the milk produced by individual cows, and the mixed milk of the Stock at the Government Stock Farm, Hope, was made during the year, and showed the maintenance of a high standard.

During the year the testing of cattle dips on behalf of the Stock Farm, and various Penkeepers, was carried out. Testing outfits and supplies of testing solutions were supplied during the period to more than fifty owners of dipping tanks.

The demand for Paranaph and Arsenite of Soda for cattle dipping increased steadily year by year, and was successfully met during the p riod. The following quantities of various commodities were distributed as compared with the amounts a shown for previous years, and necessitated among other things the manufacture of over eight tons of Paranaph.

	Official Years. 1918 19.	1919-1920.	Calendar Year. 1921.
Paranaph ..	4,5~4	10,0 2	18,166 lbs.
Arsenite of Soda	1,323	4,3 8	9,463 "
Copper Sulphate	1 667	1,804	723 "
Carbon Bisulphide	1 938	1 2 6	1.068 "
Rat Poison	994	334	227 "
Thymol Powders	132	1 1	400 Ozs.
Std. Iodine Solution		8,000	20,800 C.C.

I have the honour to be,

Sir,

Your obedient servant,

F. N. Richards,
Acting Deputy Is and Ch mist.

IX.—INDUSTRIAL CHEMIST.

Government Laboratory, Hope, Kingston P.O
January 23, .922.

Sir,

I have the honour to submit my report for the period May 18, 1920 to December 31, 1921.

2. I took up my duties as Go.ernment Industrial Chemist on May 18, 1920. As the office was a n w ne, my first task was the quipment of an Organi Chemical Laboratory. Although there has been some delay in getting apparatus from England, I am glad to report that the laboratory is now equipped with practically everything for which there was urgent need at the time. With the exception of an e'ectric motor and a few thermometers, every pie e of apparatus ordered through the Crown Agents has now arrived.

3. *Book* .—The library I found at the Laboratory was fairl well equipped with books and periodicals on Quantitative Chemistry. But excepting Beilstein's Classic Organische Chemie and A len's Commercial Organi Analysis (old editions), there was little of importance on Organic Chemistry. With the money available, a few books were at once ordered, and some useful works on Organic Chemistry have now been added to the library.

4. *Investigational Work.*—Work was begun on the Pimento Leaf Oil Problem n June, 1920, and has been steadily continued t date. On my arrival I found about 2 095 lbs. of dry male pimento leaves stored at the Farm. A small four-gallon copper still was first used in the Laboratory. Live steam was tried at first but as the vessel in which the steam was generated was too small, the results were not satisfactory The still was then filled to capacity with leaves and about four or five litres of water were added to it It was then heated and the distillate collected in the usual way. The results were fairly satisfactory. Later, conditions were modified and live steam from the steam boiler was used. This method gave good results and the large Rum Still in the distiller was then used to distil about 100 lbs. of dry leaves at a charge. The 2,095 lbs. of dry leaves referred to above gave 10,481 cubic centimetres of oil (1.7% on th dry leaves). This oil was rectified and the 30½ lbs. of 95% Eugenol obtained were shipped to England in July, 1920, where it was sold for 10/ per lb. and was reported to have been satisfactory to the makers of Vanillin who used it.

(b) From August, 1920, to June, 1921, the leaves that were bought in Walderston were distilled The distillations month by month follow:—

	Weight of leaves.	Yield in Cubic Centimetres of Oil.	% Yield of Oil.
Aug. 1920 ..	4,755 bs.	20,443 c.c.	
Sept. „ ..	22,23[illegible] „	22,233 „	
Oct. „ ..	3,994 „	24,357 „	
Nov. „ ..	3,353 „	14,950 „	
Dec. „ ..	2,258 „	7,640 „	
Jun.1921 ..	1,792 „	4,410 „	
Total	19,507 lbs	103,043 c.c.	

Over 100 lbs. of the Eugenol prepared from this oil was shipped to firms in the United States.

(c) It was found that the Eugenol in the oil obtained from the leaves above, varied considerably—from 70 to 32%. These leaves were all gathered during the cropping season, and the low Eugenol content is most likely due to the fact that the berries contain most of the Eugenol at that season of the year. Accordingly, the systematic investigation of the leaves during each month in the year was suggested. Arrangements were made and the distillation of leaves from Messrs. Ronaldson & Thursfield, Stones Hope, Manchester, the Government Stud Farm, Grove Place, and Walderston in the same parish, began in March, 1921 The distillation of leaves from the other large pimento parish, St. Ann, began in October last. The results follow —

Stones Hope—Altitude 2,500 feet.

	Total Wt.	Yield of Oil.	Weight of Oil.	Average Eugenol Cont.
Male ..	2,850 lbs.	13,365 c.c.	23.33 lbs.	89 %
Female ..	2,850 „	11,230 „	22.78 „	89.7%
Grove Place—Altitude 1,500 feet.				
Male ..	2,077 lbs.	8,030 c.c.	18.75 lbs.	89.22%
Female ..	2,375 „	7,790 „	18.00 lbs.	89.00%
Walderston—Altitude 2,600 feet.				
Male ..	2,700 lbs.	9,870 c.c.	25.5 lbs.	73.13%
Female	2,700 „	9,735 „	23.5 „	72.13%
St. Ann—Altitude 1,500 feet.				
Male ..	900 lbs.	2,554 c.c.	5.65 lbs.	53.5%
Female	900 „	2,580 „	5.15 „	49.0 %

OBSERVATIONS.

5. It will be observed that the Stones Hope and Grove Place leaves yield oils which are richer in Eugenol than the leaves from Walderston. And it would appear that altitude has little to do with the Eugenol content of Pimento Oil. The Eugenol content of Stones Hope leaves runs as high as 93%. This is also true of Grove Place oil. It is difficult at this time to say definitely what accounts for the high Eugenol content of these two oils. It is a fact that Stones Hope has not yielded a crop of 100 bags of berries this year and this may be a contributing factor. At the same time, the male leaves which were first distilled at the Laboratory in June, 1920, and which gave a rectified oil of 95% Eugenol content were gathered on this property. It will be interesting to see what the Eugenol content of the leaves is during a year in which a normal crop is gathered. The lowest Eugenol content for any month and for male or female leaves is 86%.

(b) While the Eugenol content of Grove Place oil is representative for the year under review, the yield of oil is by no means so. All of the other three places supply not less or more than 300 lbs. of male and 300 lbs. of female leaves each month, and see to it that twigs are absent from all shipments. But it has not been possible to get any definite weight of leaves from Grove Place in any month, and the last shipment contained about 10% of twigs. It is unsafe, therefore, to take the yield of oil from Grove Place leaves as representative.

(c) The Eugenol content of Walderston leaves varies from 86 to 41%. Here the crop is about normal this year. But the leaves are supplied by the small settlers and the lands on which the pimento trees grow are cultivated. This fact may account in part for the low Eugenol content of the oil.

(d) In the case of St. Ann, I say it is too early to have any definite opinion as to the yield of the leaves will produce or what the true figure for the Eugenol will be. Only three months' distillations have been recorded. I am of opinion, however, that the Eugenol content of the oil will rise, and that the year's record will be similar to that of Walderston. The crop in St. Ann is fairly large this year.

The following is a complete tabular statement showing the distillation of male and female leaves from the four districts named above from March to November, 1921:—

Date.	Kind of leaves.	Wt. leaves.	Yield oil in c.c.	Yield oil in lbs.	Per cent. oil.	Phenol Content.
		Stones Hope—Altitude 2,500 feet.				
Mar., 1921	Male	200 lbs.	215	.696	.348 lbs.	88
„	Female	300 „	315	.778	.389 „	88.8
April, 1921	Male	300 „	1,020	2.75	.92 „	88
„	Female	300 „	1,293	2.63	.88 „	88
May, 1921	Male	300 „	1,080	2.25	.75 „	88
„	Female	300 „	1,120	2.00	.66 „	86
June, 1921	Male	300 „	1,000	2.25	.78 „	88
„	Female	300 „	1,120	2.25	.78 „	88
July, 1921	Male	300 „	950	2.50	.83 „	89
„	Female	300 „	1,015	2.00	.66 „	89
Sept., 1921	Male	300 „	1,040	2.50	.83 „	90
„	Female	300 „	1,110	2.75	.92 „	92
Nov., 1921	Male	300 „	1,135	2.5	.83 „	91
„	Female	300 „	1,150	2.75	.91 „	93
		Grove Place—Altitude 1,500 feet.				
April, 1921	Male	263 lbs.	780	2.25	.82 lbs.	86
„	Female	290 „	1.005	2.50	.83 „	86
May, 1921	Male	170 „	630	1.5	.9 „	86
„	Female	168 „	610	1.5	.9 „	88
June, 1921	Male	142 „	595	1.00	.7 „	84
„	Female	154 „	585	1.00	.7 „	82
July, 1921	Male	179 „	545	1.00	.7 „	87
„	Female	194 „	505	1.00	.7 „	88
Aug., '21	Male	253 „	730	1.5	.6 „	89
„	Female	274 „	645	1.25	.5 „	89
Sept., 1921	Male	339 „	1,105	3.00	.9 „	89
„	Female	385 „	1,120	3.25	.84 „	90
Oct., 1921	Male	321 „	1,105	2.75	.85 „	92
„	Female	281 „	1,030	2.5	.85 „	89
Nov., 1921	Male	293 lbs.	970	2.25	.76 lbs.	92
„	Female	322 „	1,190	3.00	.9 „	92
		Walderston—Altitude 2,600 feet.				
April, 1921	Male	300 lbs.	930	2.25	.75 lbs.	62
„	Female	300 „	740	1.75	.58 „	52
May, 1921	Male	300 „	900	2.25	.75 „	84
„	Female	300 „	1,050	2.5	.83 „	86
June, 1921	Male	300 „	1,100	2.75	.917 „	88
„	Female	300 „	1,220	3.00	1.00 „	88
July, 1921	Male	300 „	1,470	3.5	1.2 „	76
„	Female	300 „	1,380	3.25	1.1 „	80
Aug., 1921	Male	300 „	1,100	2.5	.83 „	76
„	Female	300 „	925	2.0	.67 „	88
Sept., 1921	Male	300 „	1,150	2.75	.92 „	52
„	Female	300 „	1,045	2.5	.83 „	7
Oct., 1921	Male	300 „	625	1.25	.416 „	85
„	Female	300 „	950	1.75	.58 „	67
Nov., 1921	Male	300 „	1,090	2.75	.916 „	60
„	Female	300 „	1,220	3.5	1.16 „	41
		St. Ann—Altitude 1,500. feet.				
Oct., 1921	Male	300 lbs.	774	1.75	.58 lbs.	54
„	Female	300 „	775	1.75	.58 „	44
Nov., 1921	Male	300 „	905	2.00	.67 „	53
„	Female	300 „	1,030	2.50	.83 „	41

(f) The yield of oil here recorded is calculated on the basis of the green leaves. 100 lbs. of green leaves yield about 50 lbs. of dry leaves. If, therefore, it is desired to arrive at the amount of oil the same weight of dry leaves will yield, it is only necessary to double the figures in columns 4, 5 and 6—counting from the left.

6. *Methods of Distillation.*—My experience in the distillation of Pimento Oil for the period under review leads me to believe that the method of using dry steam under pressure is the best method to be adopted in the distillation of Pimento Leaf Oil. Distillation by this method is more rapid, and with a pressure of at least 40–45 lbs. of steam the amount of distillate is reduced to the minimum. Similarly, the idea of using the 18-foot iron pipe as a still is, to my mind, the best that could be conceived. It is also the cheapest; for while live steam is sometimes passed into wooden stills, these stills will deteriorate

much more rapidly than the pipe stills. Furthermore, the practice of adding salts to the water in the vertical stills over which the bay leaves are placed and distilled in the other islands appears to me to be of questionable value; and the method need not be adopted here. For the only advantage I can conceive of in using such a method is the slightly higher rise in the boiling point of the liquid. But this higher temperature is attained here by the use of steam under pressure. The only modification which may be added with advantage to the present "pipe still" arrangement is the super-heating of the steam before it comes in contact with the leaves. The steam pipes, boiler, and Still should be thoroughly insulated, in order to reduce to a minimum the loss of heat due to radiation; and, therefore, raise the temperature on the inside of the Still.

7. *Non-Eugenol Oils.*—It has been stated above that the oils from some Walderston leaves contain as much as 68% of a non-Eugenol fraction Unless, therefore, an outlet is found for this portion of the oil, it would not appear profitable to distil these leaves during the cropping season. A portion of these oils was roughly separated into the following fractions.

Fraction	Boil. Pt.	Sp. Gr.	Ref. Ind.	Sol, in 70% Alc.	Proportion of Distil.
A	120–230 C.	.918	..	1.21	2%
B	230–40 C.	.9,972	..	1.19	5%
C	240–50 C.	1.005	..	1.13	15%
D	250–55	1.013	1.522	1.2	75%

Specific Gravity taken at 15° C.

It is evident that a more careful separation will yield at least three different substances. For the solubility appears to group A and B together. Fraction D is undoubtedly a relatively pure substance and its reactions correspond to those of Eugenol-methyl-ether. The preparation of the Bromine derivative is necessary to confirm this assumption.

(b) Samples of these fractions were sent to the Parke, Davis & Company Laboratories in Detroit, Michigan, U.S A., in order to test their pharmacological and toxicological value. Dr. Oliver Kamm, informed me that, "In testing out the possible narcotic action of the oil we worked with a saturated water solution which, however, contained so little material that no definite effect of this nature could be determined with the maximum amount of liquid we could administer." Samples were also sent to Soap Makers, but as yet there has been no reply. Firms are usually slow in trying out new substances.

(c) It is important, nevertheless, to find an outlet for this portion of the Pimento Leaf Oil as it forms such a large proportion of the crude oil during the cropping season. And I suggest that the New York firm that is willing to contract for the whole output of the Eugenol be asked to try out the fractions or sell them to other firms. The Pimento Oil Industry will be more profitable if all the oils distilled from the leaves can be utilized as is true of the Bay Oil.

8. *Vanallin.*—The Eugenol extracted from the crude oil by means of a solution of Na Oh, after care ful purification, was rearranged according to the method given in the DeLaire Patent, No. 17547, 1890. This method is practically the same as the method of Tiemann recorded in Beilstein Organische Chemie, Vol. II., III. Auflage, page 976. Tiemann uses 2.4 parts of KOH to one part of Eugenol while DeLaire uses 2.5. Tiemann uses 3.6 of Amyl Alcohol while DeLaire uses 5 parts. As a matter of fact, I have found in practice that the amount of Amyl Alcohol used by DeLaire can be reduced without affecting the rearrangement.

(b) In the making of Iso-eugenol Acetate the DeLaire method was followed. I found that his method worked fairly readily with the Eugenol from Oil of Cloves, but gave no results with the Eugenol I prepared in the Laboratory. The difficulty was soon discovered, however, and the acetyl derivative was successfully prepared.

(c) The Patents which were rece ved from the Patent Office in London, and which professed to give accurate details for the making of Vanillin on the oxidation of Eugenol, Iso-eugenol, and the allied compounds, afforded little assistance. It is common knowledge that patents are not patents if anyone is able to make much use of them, and that any Chemical manufactures are Trade Secrets.

Acting, therefore, on the broad theoretical basis for the preparation of aldehydes, the resistance of the C: C double linkage to oxidation by mild oxidizing agents but its extreme sensitiveness to strong oxidizing agents, I devised a novel permanganate process for the oxidation of Iso-eugenol acetate to Acetvanillin with a yield of at least 50%. The reaction is extremely sensitive and is very difficult to control. The Vanillin so made was submitted to the Imperial Institute, London, and was confirmed to be Vanillin, but was held to be rather dark in colour for the English market. It is obviously impossible to make more than laboratory samples of Vanillin by hand. The need of an Electric Motor in the experiment is imperative. As yet, a suitable electric motor has not been obtained and the Vanillin work must necessarily await the oxidation stage until a suitable laboratory motor has been obtained.

9. *General Remarks.*—It is advisable, I think, that I should say a word on the distillation of Pimento Leaf Oil by private individuals in the island.

It should be known that the Pimento Leaf Oil has to compete with Oil of Cloves on the markets of the world. The Clove yields from 10 to 13% of crude oil whose Eugenol content varies from about 70 to 93%. Pimento leaves, on the other hand, yield, so far, slightly over 2% of crude oil, and it has been shown above that at certain seasons of the year and in certain areas the Eugenol content may be as low as 32%. It is evident, therefore, that the Pimento Leaf Oil Industry must, if it is to succeed, produce an oil of not less than 95% Eugenol content for export. In short, the oil sent from Jamaica should be higher in Eugenol content than the best quality Clove Oil.

I have the honour to be,
Sir,
Your obedient servant,

E. E. A Campbell, M.Sc.,
Industrial Chemist.

Director of Agriculture,
Hope.

TABLE SHOWING RESULTS OF PIMENTO OIL DISTILLATIONS FROM MARCH TO NOVEMBER, 1921.

	For each of the Four Districts.				For the Four Districts Combined shewing each Month Separately.								For the Four Districts and for entire Period. Average of all Samples.
	Stones Hope.	Grove Place.	Walders-ton.	St. Ann.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	
(1) Average percentage of oil from Male Leaves ..	.756 lbs.	.79 lbs.	.84 lbs.	.63 lbs.	.83 lbs	.80 lbs	.80 lbs	.91 lbs	.72 lbs	.88 lbs	.68 lbs	.84 lbs	
(2) do. do. Female leaves	.743 „	.78 „	.85 „	.70 „	.76 „	.79 „	.83 „	.82 „	.63 „	.89 „	.72 „	1.00 „	
(3) do. do. Male and Female leaves ..	.75 „	.78 „	.67 „	.67 „	.795 „	.795 „	.815 „	.865 „	.675 „	.885 „	.70 „	.92 „	.806 lbs.
(4) Average per cent available Engenol, Male leaves	.671 „	.69 „	60 „	.34 „	.66 „	.68 „	.70 „	.75 „	.61 „	.67 „	.60 „	.66 „	
(5) do. do. Female leaves	.668 „	.69 „	.60 „	.30 „	.60 „	.69 „	.68 „	.70 „	.57 „	.73 „	.61 „	.72 „	
(6) do. do. Male and Female leaves ..	.670 „	.69 „	.60 „	.32 „	.63 „	.685 „	.69 „	.725 „	.59 „	.70 „	.655 „	.69 „	.67 lbs.

X.—The Use of Rum for Motor Spirit.

Experiments on this matter have been carried out with the assistance of the Director of Public Works. A sample of the "Motor Spirit" now being used in Cuba was imported by Mr. C. Pringle of Gray's Inn Central Factory.

This was found to contain 30 per cent. of rectified spirit. Allowing for the Gasolene the rectified spirit only gave 55 per cent of the mileage of commercial gasolene in an ordinary Motor Truck engine. Experiments by the Public Works Department showed that the gasolene present prevented the increasing of the compression in the Cylinders so as to get more power from the explosion of the alcohol. This Motor Spirit rendered it very difficult to start the engine from cold.

A small quantity of Etherised Motor Spirit containing 35 per cent of Sulphuric Ether was found to start the engine with great ease and to generate good power. A larger amount of 40 gallons has now been prepared by the Industrial Chemist and is being tested out by the Public Works Department.

The following 'data' were deduced as a basis for starting a Central Rectifying Plant for the manufacture of Etherised Motor Spirit:

Data as to Motor Spirit.

1. 1,000 gallons 40 O.P. Rum will give 800 gallons of "95 per cent. Alcohol" at 67 O.P. with an efficiency of 95 per cent. in the rectifier.
2. 100 gallons of "95 per cent Alcohol" at 67 O.P. will gve 88 gallons of Sulphuric Ether (theoretically). Actual yield approximately 75 gallons.
3. 1,000 gallons of 40 O.P. Rum will give 716 gallons of Motor Spirit containing 35 per cent. of Sulphuric Ether.

   465 gallons Alcohol
   251 ,, Ether
   ———
   716 ,, Motor Spirit.
4. The efficiency of this 35 per cent. Ether Motor Spirit as against gasolene in a Motor Car Engine is stated to be 92 per cent.
5. The present bulk price of gasoline, ex duty, in Kingston is 2/4 per gallon, the equivalent value of Motor Spitit would therefore be 2/2 per gallon.
   The basal equivalent price of Motor Spirit should therefore be 2/- per gallon, ex duty, to wholesalers.
6. The denaturant is estimated to cost 2/- per gallon. It will be controlled by Government and be supplied at cost and will not affect the price of Motor Spirit ex-factory.
7. Ether boils at 95 degrees Fahrenheit. Ice will therefore be required in Jamaica and must be allowed for at 2/- per 100 lbs. on the cost of making Ether in Kingston.
8. *Cost of Plant.*

Rectifying Still	£3,900
Ether Plant	4,200
Boilers, etc	1,580
Storage Tanks	400
Steel Frame Building	1,843
Blair Campbell's Tender f.o.b. Glasgow	£11,923
Freight, Charges Erection, Extras	2,077
Total cost of Factory	£14,000

Interest and Sinking Fund at 10 per cent. on £14,000 ..... £1,400 per annum.
Interest charges per gallon on 800,000 gallons rum 40 O.P. 0.42 pence per gallon of rum per annum.

Cost of Operating Plant.

Coal at £2 per ton. Consumption 5 cwt. per hour—20/- per 1,000 gallons rum.
Labour, 30/ per day—1/6 per hour—3/- per 1,000 gallons of rum.
Management, 40/- per day—2/- per hour—4/- per 1,000 gallons of rum.
Supplies and Incidentals, 30/- per day—1/6 per hour—3/- per 1,000 gallons of rum.
Ice, 10/- per day—6d. per hour—1/- per 1,000 gallons of rum.
Interest Charges, 35/- per 1,000 gallons of rum.
Total Costs.....66/- per 1,000 gallons of rum.

Returns of Rum converted into Motor Spirit.

1,000 gallons rum give 716 gallons Motor Spirit at 2/-	71	12	0
Deduct costs	3	6	0
Net	£68	6	0

1,000 gallons rum will earn £68 6/- at the Factory equal to 1/- and 3.66 pence per gallon to the planter at the Factory, say 1/4 per gallon for 40 O.P. Rum.

H. H. Cousins.

XI.—Government Microbiologist.

This office was vacant during the whole year owing to the transfer of Mr. S. F. Ashby, B.Sc., to the Staff of the Imperial Department of Agriculture for the West Indies.

The new Officer, Mr. C. G. Hansford of King's College, Cambridge, took up his duties on April, 4th, 1922.

XII.—Government Entomologist.

Sir,

I have the honour to submit my annual Report for the year ending December 31st, 1921.

2. The insects which were of economic importance during the period under review are dealt with under the headings of the crops on which they occurred.

Staple Crops.

Coconuts.

The insects that were reported as attacking this crop were:—

1. The Florida Red Scale, *Chrysomphalus aonidum*, (L).
2. The White Fly, *Aleurodicus cocois*, (Curt).
3. The Shot-Hole Borer, *Xyleborus* sp.

Banana.

1. The Banana Borer, *Cosmopolites sordidus*, Germ. Three attacks by this insect were investigated during the year. On one estate on which the destruction of the breeding places of the borer was systematically carried out, as recommended, the attack has greatly lessened. In a certain district in which an attack was investigated it was found that no attention was being paid to the destruction of the breeding places. In another district it was found that not only were the breeding places disregarded, but that infected suckers were being planted. So, in addition to the recommendations made in my previous Annual Report, it is necessary to add the obvious one that only uninfected suckers be planted.

Cacao.

1. The Scale Insect, *Asterolecanium aureum*, Targ.
2. Thrips, *Selenothrips rubrocinctus*, (Giard). This species was very prevalent during the dry months of the year on this crop, as well as on mango and pear.

Citrus.

1. Mites. One case of mites was dealt with from Brown's Town.
2. Scale Insects. The scale insects which are the most prevalent on Citrus are *Lepidosaphes beckii*, (Newm)., the Long Scale, also known locally as the Mussel scale, and *Chionaspis citri*, (Comst.), the Snow Scale. The Scales are causing considerably more damage than the Black Fly. It is matter of interest to record that on those trees on which the Dugald Campbell ant, *Cremastogaster brevispinosa* Mayr. var. *minutior*, For., occurs and which are infested but slightly by the Black Fly are also but slightly infested by the Snow Scale.
3. Aleurodids. Infestations by the Black Fly, *Aleurocanthus woglumi*, Ashby, appeared to be somewhat milder than during the preceding year. In several cases the entomophytous fungi—the Bright Red Fungus and the Brown Fungus—have been established and are playing an important part in the control of this pest. The Brown Fungus is slower in getting established than the Bright Red Fungus, but is hardier. Several lectures were delivered in the Citrus-growing sections and stress laid on the necessity for the adoption of cultural measures and the utilization of the natural enemies—the fungi and the ant, *Cremastogaster brevispinosa*, Mayr., var. *minutior*, For.

In addition to the above Aleurodid, two other species have been discovered on this crop—the Spiny White Fly, *Aleurocanthus spiniferus*, (Quaint.), and *Aleurothrixus floccosus*, (Mask.)—both of which, at the present time at any rate, may be regarded as minor pests.

Sisal.

1. The Weevil, *Scyphophorus acupunctatus*, Gyl. Only one case of this weevil has come under my observation.
2. The Scale Insect, *Pseudischnaspis bowreyi*, (Ckll). This insect was very much less prevalent than in the preceding year.

Tobacco.

1. The Tobacco Worm, *Protoparce sexta*, (Br). There were two very serious outbreaks of this caterpillar. In both cases 'worming' having failed to cope with the heavy infestation, dusting with arsenicals was resorted to, resulting in the rapid diminution of the caterpillars. The eggs are deposited singly on the lower surfaces of the leaves; the incubation period is from four to six days; the larval period about three weeks, during which the larva molts five times; the pupal stage is about three weeks and is spent in the soil at a depth of a few inches. The insect aestivates in the pupal stage.
2. Cutworms. There were two very serious outbreaks of these insects, the most serious outbreaks I have encountered. The usual poison bait was applied in both cases.

Sugar Cane.

1. Caterpillars. There were a few outbreaks of the caterpillars of the moth, *Moica repanda*, (F.), on Sugar cane in the parish of St. James. The caterpillars were found to be parasitized by a Tachinid fly, *Linnaeymia fulvicauda*, Walton, and by an Ichneumon, *Ophion* sp.
2. 'White Grubs.' One case of an attack by the larvae of the beetle, *Lachnosterna jamaicensis*, Arrow, was reported.
3. The Moth Borer, *Diatraea saccharivorus*, Westw. Although ubiquitous, this insect does not rank as a serious pest.

Pimento.

1. The scale insect, *Llaveia primitiva*, var., *pimentae*, Newst. Specimens of this insect were submitted by one correspondent.

Yam.

1. The beetle, *Palaeopus discorae*, Pierce. A few cases of attacks by this insect were reported.
2. The Scale insect, *Aspidiotus hartii*, (Ckll). Several cases of this insect were observed.

Truck Crops.

Beet.
Reports were received of attacks on this crop by—
1. Cutworms,
2. Crickets,
3. The Beetle, *Disonycha laevigata*, Jac.

Tomato.
The stink bug, *Nezara marginata*, P. de B., attacked this crop in several localities.

Cucumber.
Complaints were rceived of attacks by the 'Striped Cucumber Beetle,' *Diabrotica theimei*, Baly.

Ornamental Plants.

Geranium.
1. The Scale Insect, *Aulacaspis pentagona*, (Targ.)

Carnation.
1. Ants.

Rose.
1.. The Florida Red Scale, *Chrysomphalus aonidum*, (L).
2. The Beetle, *Metachroma* sp.

Fruits.

Ackee.
1. The Scale Insect, *Pulvinaria cupaniae*, Ckll.

Naseberry.
1. The Hemispherical Scale, *Saissetia hemisphaerica*, (Targ).

Fig.
1. The Beetle Borer, *Tetrapriocera tridens*, (F.)

Mango.
1. The Fruit Fly, *Anastrepha fraterculus*, Weid. This was particularly prevalent in Bombay mangoes.
2. Thrips, *Solenothrips rubrocincta*, (Giard). Attacks by this insect were very severe.

Avocado Pear.
1. The Beetle Borer, *Apate terebrans*, P. de B.
2. Thrips, *Solenothrips rubrocincta*, (Giard).

Grape.
1. The Green Fly, *Aphis illinoisensis*, Schimer.
2. The Scale Insect, *Aspidiotus cydoniae*, Comst.

Household Pests.

These included 'white ants,' *Eutermes ripperti*, Ramb., and Bostrichid borers attacking the woodwork of buildings and furniture, and ants, cockroaches and the skin-beetle, *Attagenus gloriosae*, (F).

Grain Pests.

Advice was sought for the advice of the control of the Mediterranean Flour Moth and the Confused Flour Beetle, *Tribolium confusum*, attacking flour.

3. *Sericulture*—A report was submitted to you on the advisability of developing a silk industry as a 'Cottage industry' in Jamaica.

4. *Mosaic Disease.* Experiments are being carried out with the view of ascertaining the part, if any, that insects play in the transmission of this disease.

5. *Tours.* Fifteen tours were made into the country for the purpose of of investigating outbreaks of insects and for delivering lectures.

6. *Lectures*—A lecture on Economic Entomology was delivered at the Farm School during the Course for Agricultural Instructors. Lectures on the Black Fly were delivered to the Branches of the Jamaica Agricultural Society at Mocho, Richmond, Bath, Buff Bay, Snowden and Bellefield.

7. *Publications.* The following publications were issued during the year:—
Circular 1.—Directions for Killing, Preserving and Packing Insects.
Circular 2.—Directions for Submitting Specimens.
Circular 3.—The Citrus Black Fly.
Circular 4.—The Fall Army Worm.
In Press—
Circular 5.—The Prevention and Control of Insect Pests.
Bulletin 1.—The Scale Insects of Jamaica.

8. *Collection.* A collection of insects has been started and is progressing rapidly. It consists of over 1,000 species, a large number of which have been identified.

9. *Plant Diseases.* In the absence of a Microbiologist correspondence on this subject has been dealt with by the Entomologist.

I have the honour to be,
Sir,
Your obedient servant,

C. C. Gowdey,
Government Entomologist.

XII.—AGRICULTURAL LEGISLATION IN 1921.

A. Laws Relating to Agriculture Passed during the year, 1921.

Law No.	Date Assented to	Short Title.	Chief Provisions.
6	25th May, 1921.	The Saint Thomas Central Factory (Contracts) Amendment Law, 1921.	Making it lawful for the Government to enter into a contract with an owner of lands outside of and apart from the Principal Law (Law 52 of 1920).
10	12th July, 1921	The Sugar Industry Aid Loans Law 1921	(a) Authorising the Governor to raise a loan not exceeding £400,000 at interest not exceeding 7% to be used for the purpose of making loans to Sugar Planters for the preservation of the Sugar Industry; loans so made to bear interest at a rate not exceeding 1% over the rate payable in respect of the loan raised by the Government, and to constitute a debt which shall be the first lien or charge against the land, crops, produce, live and dead stock of the borrowers. (b) Constituting "The Sugar Industry Aid Board" to carry out the provisions of the Law.
25	15th Sept. 1921	The Fruit Inspection Law 1921.	(a) Making it lawful for the Governor to issue and revoke Proclamations prohibiting or governing the buying, selling or exporting of immature fruit. (b) Making it lawful for the Governor to appoint Inspectors to carry out the provisions of the Law.

B. Orders, Rules, etc., Relating to Agriculture made during the Year, 1921.

Date	Description.	Subject.
1921.		
22nd February	Regulation Under Law 20 of 1920	Authorising the Director of Agriculture to permit the Importation of Honey from the Cayman Islands.
19th April	Order Under Law 24 of 1890.	Permitting the landing of Dogs from Great Britain provided satisfactory proof of six months quarantine prior to departure from United Kingdom can be produced.
24th October	Order under Law 3 of 1915.	Prescribing measures for treatment of Banana trash at all buying Stations in Parishes of Portland, St. Mary, St. Ann and Hanover.
12th November	do (The Panama Disease of Bananas Order, 1921).	Parishes of Portland and St. Ann declared to be suspected of being infected with Panama Disease of Bananas and subject to the provisions of the Panama Disease of Bananas Order, 1915. Removal of Banana suckers out of suspected area prohibited.
26th November	Order under Law 3 of 1915.	Buying Stations in St. Andrew and St. Catherine declared to be suspected of being infected with Black Weevil Borer of Bananas and measures prescribed for treatment of Banana trash at all buying Stations in these Parishes.
5th December	Order (The Tick Control & Eradication) Order 1921, Under Law 41 of 1920	Ordering the construction of Dipping Tanks before 1st May, 1922, on all holdings with one hundred head of cattle

XIV.—Staff.

During the period under review the offices of Assistant Director and Government Botanist, Microbiologist, and Deputy Island Chemist remained vacant.

Mr. G. D. Goode continued to act as Assistant Director, Mr. M. S. Goodman as Superintendent of Public Gardens and Mr. E. N Richards as Deputy Island Chemist.

Mr. W. E. Watson, was promoted from an Assistantship to fill the newly created post of Second Class Clerk and Cashier.

Mr. R. A. White was appointed to succeed Mr. Watson as Assistant.

Mr. H. R. Angell, Assistant Master of the Farm School, obtained two months' vacation leave as from 1st May and resigned his appointment at the expiration of his leave.

Mr. L. Anglin Powell was appointed to fill the vacancy created by Mr. Angell's resignation.

Mr. W. Cradwick, Senior Agricultural Instructor, was absent from the Colony, on leave for eight months as a result of ill-health.

Mr. R. S. Martinez, Headmaster of the Farm School obtained vacation leave for 3½ months. During his absence Mr. A. F. Thelwell acted as Headmaster.

I have the honour to be,

Sir,

Your obedient servant,

H. H. Cousins,

Director of Agriculture.

The Honourable
The Colonial Secretary